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A STARRY SOLUTION TO THE STONEHENGE ENIGMA

AVEBURY'S CELESTIAL SECRETS
Did Ancient Astronomers Encode the Cosmos in Stone?

Nemrut Dağ's Eternal Watch
A Royal Monument Written in the Stars

ITALY
Alatri, The City of the Cyclops

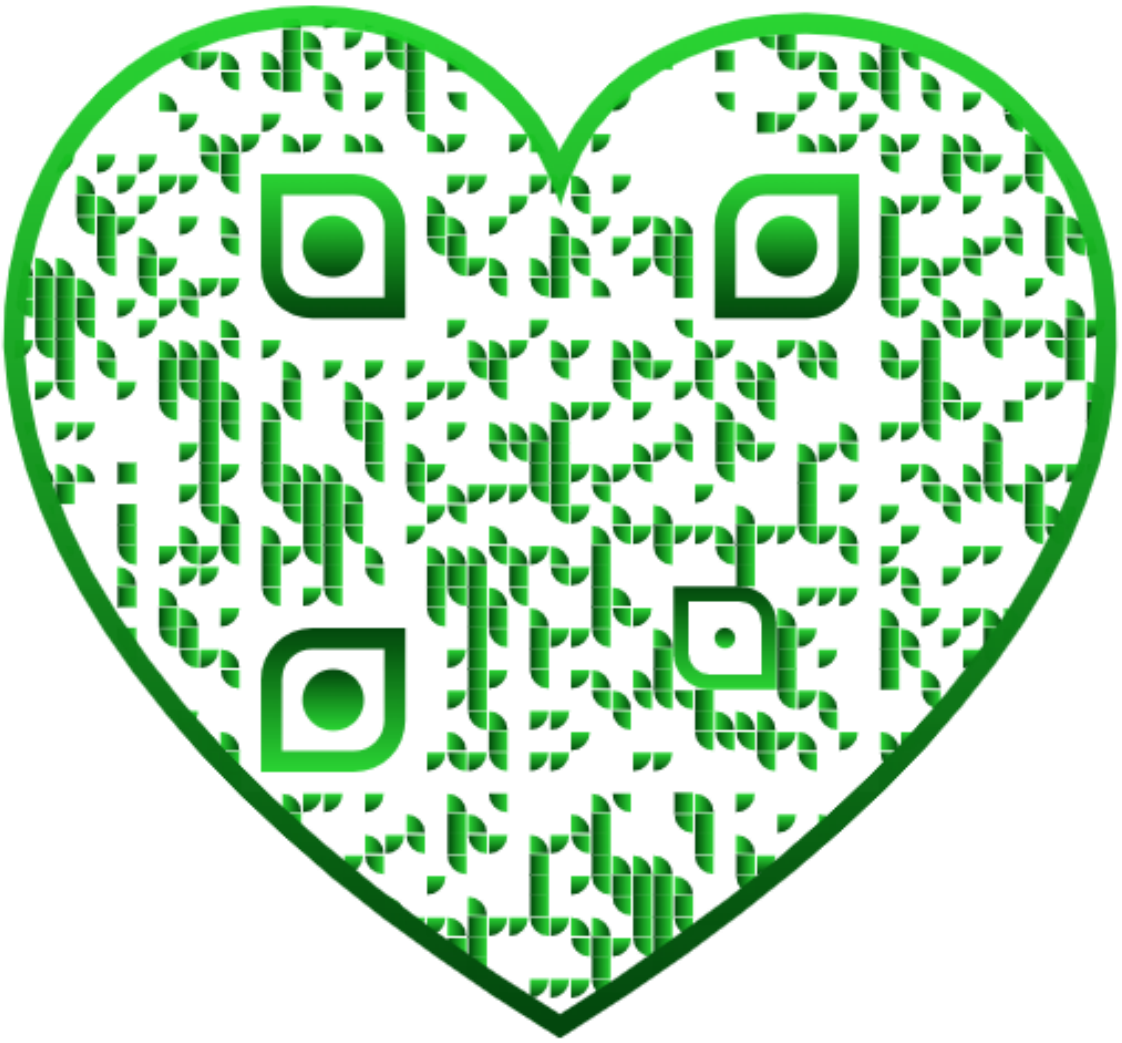
Academy of Taste
The Food of Heroes: Meat and Lentils in the Iliad

Power of the Solstice
The Goseck Circle and the Nebra Disk

THE LOST CODE OF ARCHEOASTRONOMY

How Pyramids, Dolmen and Stone Circles Mirrored the Night Sky

plus The Great Pyramid of Giza: Egypt's Cosmic Monument to the Stars
Nabta Playa: The Sahara's Forgotten Observatory



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The Celestial Blueprint: Astronomical Architects of Solstice and Equinox Around the World

A Starry Solution to the Stonehenge Enigma

Avebury's Celestial Secrets: Did Ancient Astronomers Encode the Cosmos in Stone?

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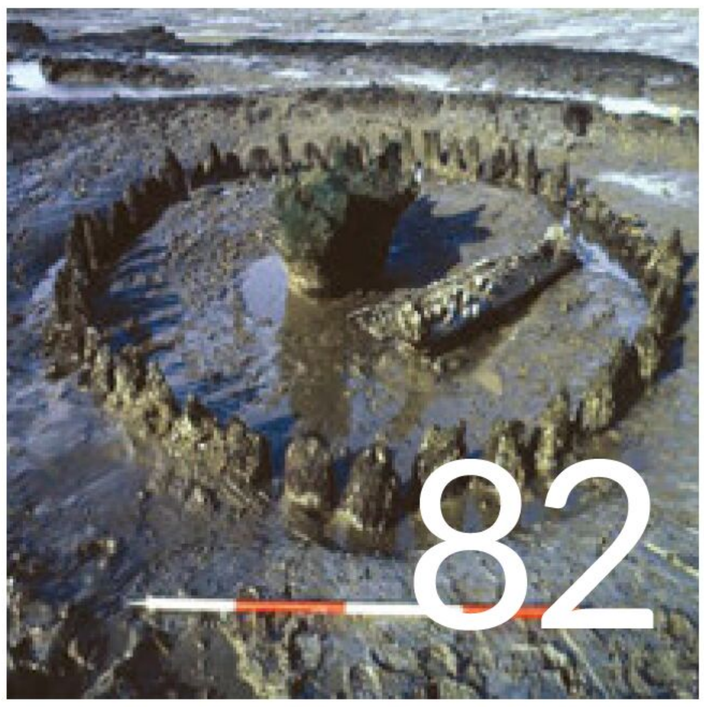

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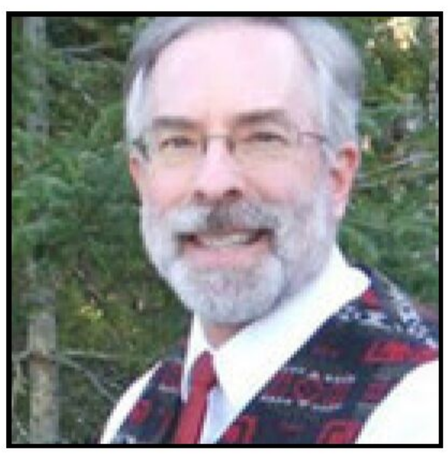
Experts in this issue...

Ashley Cowie

Ashley Cowie is a distinguished author known for his four non-fiction books and more than 2,000 articles on archaeological and scientific topics. His work spans documentaries, books, and podcasts, and he has produced and hosted projects for major networks including Discovery Channel, NBC, PBS, and STV.



Paul Barley

I earned Bachelor of Civil Engineering and Bachelor of Science – Geology degrees from the University of Minnesota, and began my career as a construction engineer. Over the course of 30 years I've investigated physical landscapes and historical cultural developments of thousands of sites across North America.

Gary Manners

Gary is an editor and content manager for Ancient Origins. He has a BA in Politics and Philosophy from the University of York and a Diploma in Marketing from CIM.

Anthony Murphy

Anthony Murphy is a journalist. A former newspaper editor, he wrote Island of the Setting Sun: In Search of Ireland's Ancient Astronomers with Richard Moore, and more recently published Newgrange: Monument to Immortality.

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Alicia McDermott holds degrees in Anthropology, Psychology, and International Development Studies and has worked in various fields such as education, anthropology, and tourism. Traveling throughout Bolivia, Peru, Colombia, and Ecuador, Alicia has focused much of her research on Andean cultures – past and present.

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I am published author of over ten historical fiction novels, and specialize in Slavic linguistics. Always pursuing my passions for writing and literature, I strive to deliver a thrilling and captivating read that touches upon history's most enigmatic subjects.

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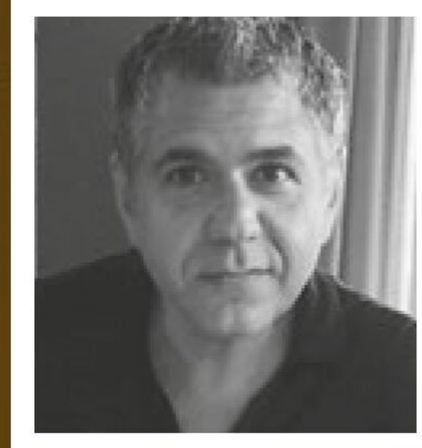
Bryan graduated with a Bachelor of Art in History from Suffolk University. He has traveled extensively across the United States as well as internationally. Along with being a History graduate, Bryan is a member of the Phi Alpha Theta National Honors Society. In his spare time, Bryan enjoys working out, reading and has an interest in medicine and nutrition.

Guido Cossard

Guido Cossard has a degree in physics and is President of the Association for Research and Studies in Archaeoastronomy in Valle d'Aosta. An active lecturer, he has given numerous conferences in the field of astronomy and, in particular, archaeoastronomy.



Massimo Bonasorte

Chief Editor, Ancient Origins Magazine

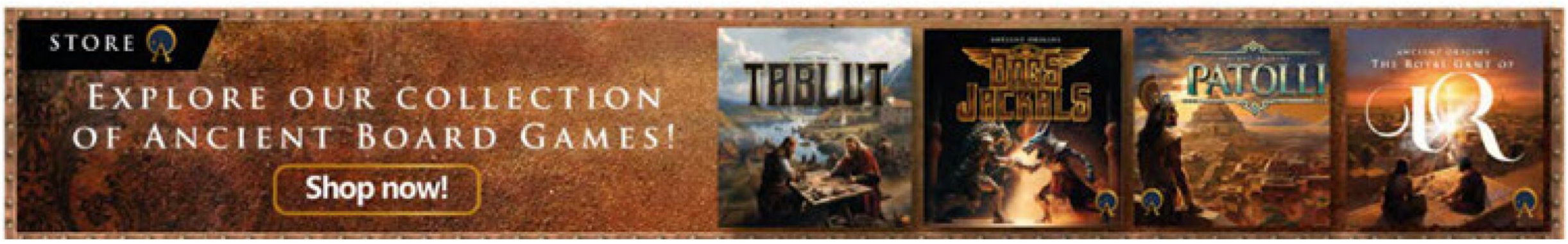
In this issue, we turn our gaze to the ancient bond between humanity and the stars, a dialogue that has shaped belief, power and imagination across millennia.

To our forefathers, the night sky had not been empty. It was a great drama of light and shadow which was unpredictable and constant, frightening, and supporting. The appearance of Sirius was a sign that the Nile was about to flood, and the result was the bringing of life back to Egypt. The group of Orion was transformed into a heavenly hunter, and this can be seen in myth and stone, with his presence serving to guide the farmers, the priests, and the rulers. The solstices and equinoxes of the Sun were followed with a precision which was nothing short of marvelous, as the pivot of time itself, the regulation of the agricultural labor of the people by the cult, and the cult by the kings.

What we today understand to be astronomy was to ancient people inseparable from religion and politics. Gods spoke the celestial cycles and by observing the rhythms the human world was brought in touch with the cosmic order.

The motions of life were determined by the cyclical motion of celestial bodies: when to plant, when to harvest, when to move herds. It was a matter of survival. But it was also spiritual. The winter solstice was not merely a date, but an occasion of general fear and hope, a prayer that the Sun would come out of the abyss of extinction. This drama was played on monuments such as Stonehenge and fixed their world to the unchangeable laws of the universe.

They wanted to make sense out of the disorder of the sky, as they thought that what was going on above was reflected on the ground. They established a connection with a huge unknown universe by constructing a direct connection to the heavens. It was a religious thing, not spoken, but carved in stone and darkness. The sky was a map, a clock, the place where the gods lived and human fate was engraved. They were not just observations but cosmic conversation: stars ruled the days, authorized kings, and connected the earthly and the divine.



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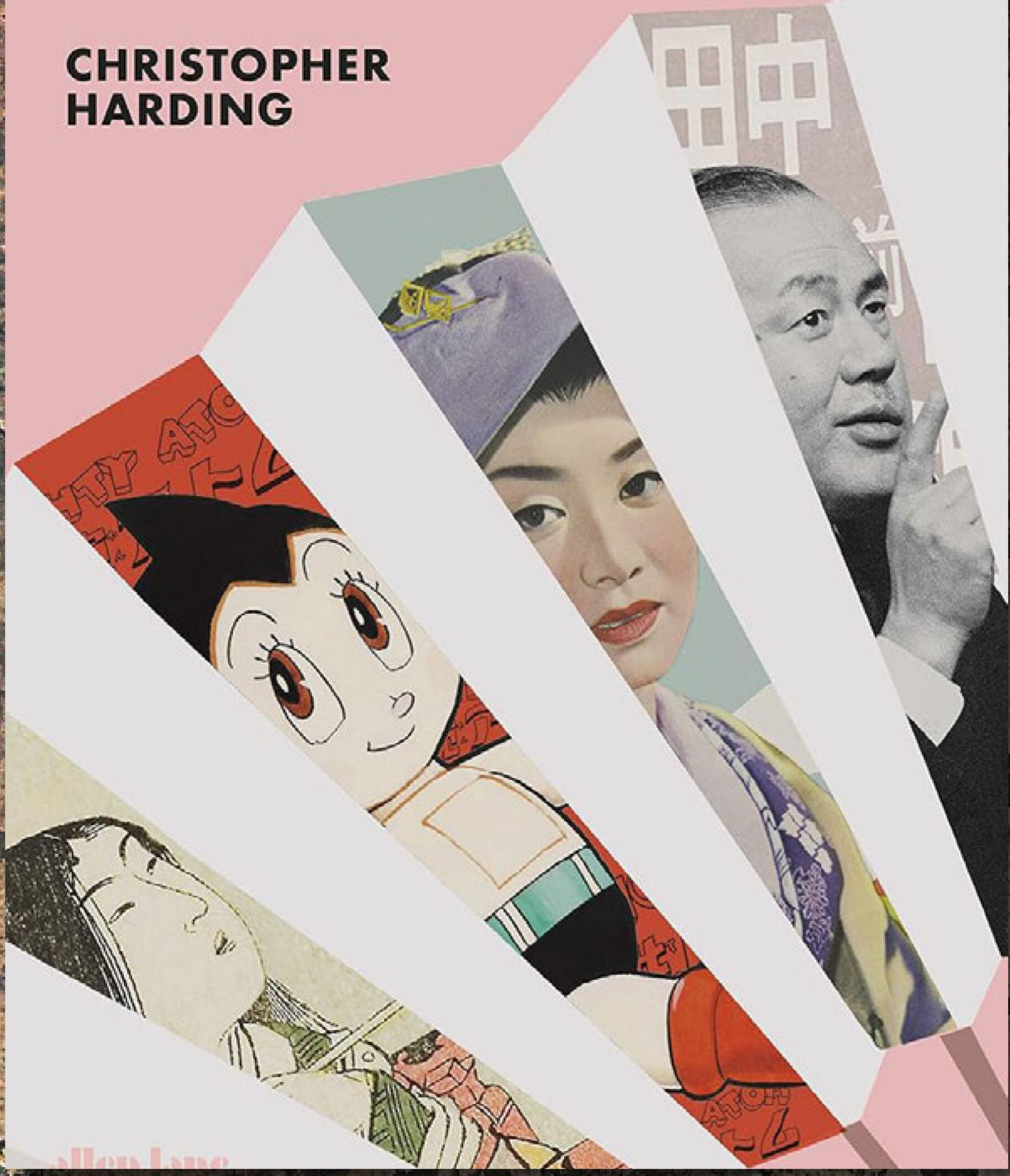
THE JAPANESE

A History in Twenty Lives

CHRISTOPHER HARDING



By Gary Manners

TOWERING BRONZE AGE WARRIOR FOUND IN 3,800-YEAR-OLD AZERBAIJAN KURGAN

Archaeologists in Azerbaijan have made an extraordinary discovery that is reshaping our understanding of Bronze Age elite society. A massive 3,800-year-old kurgan burial mound has yielded the intact remains of a towering warrior leader, along with rare bronze weapons and ceremonial artifacts that reveal sophisticated burial practices from the Middle Bronze Age period.

Located in the Ceyranchol plain at a site known locally as "Yovsanlidere," the discovery has been hailed as one of the most significant archaeological finds in the South Caucasus region, reported Popular Archaeology. The kurgan itself measures an impressive 28 meters (92 feet) in diameter and rises 2 meters (6.5 feet) high, containing a burial chamber that extends 6 meters (19.5 feet) in length, 2 meters (6.5 feet) in width, and 3 meters (10 feet) in depth. What makes this discovery truly exceptional is the warrior buried within – estimated to have stood over 2 meters (6' 7") tall, making him a giant by ancient standards.

Dr. Shamil Najafov, who led the excavation team, discovered the warrior buried in a semi-flexed position, clutching a rare four-pronged bronze spearhead - a weapon type considered extraordinarily uncommon not only in Azerbaijan but across the entire South Caucasus region. This unique spearhead suggests the deceased held significant military status and possibly commanded respect across a wide territory, noted *Heritage Daily*.

The burial chamber reveals sophisticated religious beliefs through its unique three-section design. The first section housed the warrior's remains and personal equipment, while the second contained elaborate ceramic vessels filled with provisions for the afterlife. The third section was left completely empty, which archaeologists believe represents a symbolic space for the deceased's soul to find nourishment and peace in the afterlife.

Among the remarkable grave goods were bronze ankle adornments, paste beads, obsidian tools, and twelve intricately decorated ceramic jugs featuring complex dotted and impressed motifs filled with white inlay. Inside these vessels, archaeologists discovered bones from cooked animals including goat, cow, horse, and boar – clear evidence of elaborate funeral feasting and provisions for the afterlife journey.

RARE PINK GRANITE FALSE DOOR REVEALS ROYAL PRINCE'S LOST LEGACY AT SAQQARA

A groundbreaking discovery at Egypt's Saqqara necropolis, unearthed the 4,400-year-old tomb of Prince Userefre, son of King Userkaf, the first pharaoh of Egypt's Fifth Dynasty. The tomb features an unprecedented pink granite false door - the largest ever discovered in Egypt - measuring 4.5 meters in height and 1.15 meters in width (15 ft by 4 ft). The find sheds new light on royal burial practices during the Old Kingdom period and represents one of the most significant archaeological discoveries at Saqqara in recent years.

The discovery was made by a joint archaeological mission from the Supreme Council of Antiquities and the Zahi Hawass Foundation for Antiquities and Heritage. Dr. Mohamed Ismail Khaled, Secretary-General of the Supreme Council of Antiquities, explained that this marks the first time a false door of such magnitude made from pink granite has bee found anywhere in Egypt. The door is decorated with hieroglyphic inscriptions detailing Prince Userefre's impressive titles, including "Hereditary Prince, Governor of the Buto and Nekhbet Regions, Royal Scribe, Minister, Judge, and Chanting Priest." False doors held profound spiritual significance in ancient Egyptian burial customs, serving as symbolic portals through which the deceased's soul could travel between the world of the living and the afterlife.

SUPER-RARE 2,000-YEAR-OLD ROMAN MILITARY SUN HAT UNVEILED

A remarkable 2,000-year-old Roman military hat, one of only three known examples worldwide, has finally gone on public display at Bolton Museum after more than a century in storage. This exceptionally preserved woolen head covering, believed to have been made for a Roman soldier following the conquest of Egypt after Queen Cleopatra's death in 30 BC, represents a unique glimpse into military life in Roman-occupied Egypt.

The hat, now considered the best-preserved example in the world, was donated to Bolton's first museum in 1911 by Sir William Matthew Flinders Petrie, the pioneering archaeologist who revolutionized Egyptian excavation methods. The other two known examples are housed at the Whitworth Art Gallery in Manchester and a museum in Florence, Italy, making this public debut particularly significant for understanding Roman military adaptation to harsh Egyptian conditions. According to the Bolton News, the conservation work was undertaken by textile expert Jacqui Hyman. The hat dates to approximately 200 AD and appears to have been specifically adapted for Egyptian environmental conditions, including protection from intense desert sun and sandstorms. This practical adaptation demonstrates how Roman military equipment evolved to meet the demands of different climates across their vast empire, particularly in the challenging environment of Egypt.

© Roop Dey

GUARDIANS OF THE DESERT WATERS: GADI SAGAR LAKE OF JAISALMER

Gadi Sagar Lake, in Jaisalmer—not Jaipur—guards ancient architectural remnants steeped in myth. Built in the 14th century, the lake once provided water to the fortified city. Scattered along its banks and floating on islets are forgotten temples, crumbling shrines, and ornately carved chhatris. Locals whisper of hidden tunnels beneath the water and lost relics submerged by time. One gateway, the Tilon-ki-Pol, was built by a courtesan, defying royal taboo. Today, the ruins remain silent keepers of stories untold.

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UNRAVELLING THE MYSTERIES OF THE PAST

GREECE: RUINS OF ACROPOLIS OF LINDOS, RHODES, DODECANESE ISLANDS

The Acropolis of Lindos, which is a 116-metre-high spur above the village, has a mix of Doric ruins, Hellenistic steles and medieval walls. The Temple of Athena Lindia, which has been reconstructed in the 4th century BC following a fire, is the highest in the list, as the witness of the Panhellenic cult of the goddess of wisdom. The Chronicle of Lindos, an inscription of dedication and miracle of Athena dated 99 BC, is an interesting source that gives us a glimpse of local religiousness and collective recollection.
The acropolis today, encircled by the medieval ramparts and the classical columns, has maintained a landscape that is kept in a vacuum of time and every stone has a secret that is yet to be unlocked.

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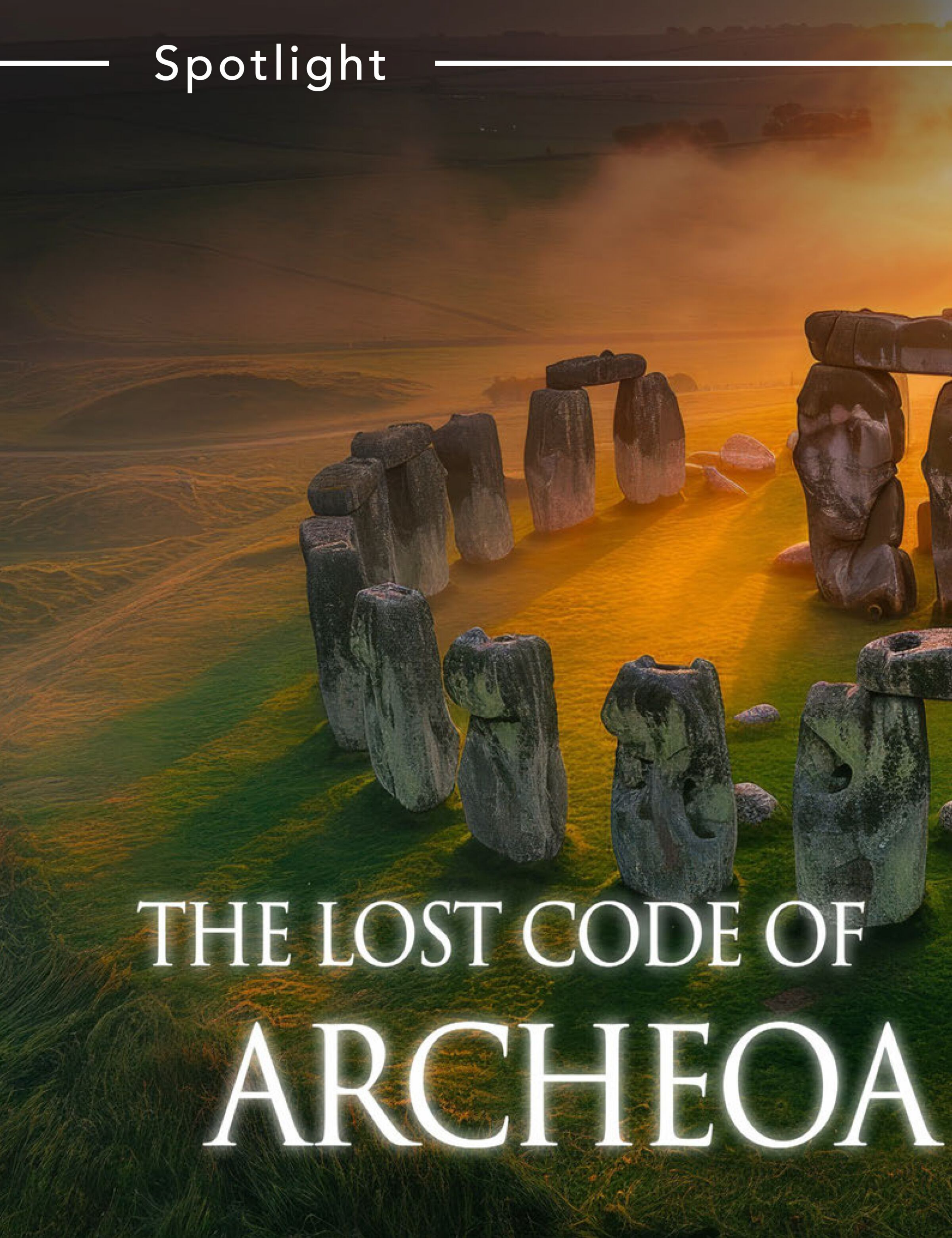
Spotlight



HOW PYRAMIDS, STONE CIRCLES,
AND CEREMONIAL CENTERS
MIRRORED THE NIGHT SKY

STRONOMY

The Celestial

Astronomical Architects of Solstice and

Blueprint

Equinox Around the World

BY ASHLEY COWIE

Both beneath and beyond Stonehenge in England, the Great Sphinx and Pyramid of Khafre in Egypt, Machu Picchu in Peru, Chichen Itza in Mexico and Newgrange in Ireland, exists an underlying code that binds the distant builders. Distant, in both space and time, yet the constructions are fused in that they were all built in honor of the quarters of the year, the two solstices and equinoxes. Today this data is available from apps at the click of a mouse, but in the ancient world, ceremonial standing stone circles and temples evolved from the earliest stone observatories, which themselves were designed to pin down the four observable corners of the cosmos. At the very earliest stages of sky watching among the first observations that really mattered, in that they directly affected climatology and therefore survival, were the two equinoxes and two solstices. These four key astronomical events occur due to the way earth orbits the sun on its tilted axis, and while some may consider humankind's ancestors as primitive, they had a much closer and experiential relationship with the cycles of the heavens.

El Castillo Temple, Chichen Itza
(©popovatetiana)

To overcome the apparent chaotic nature of the night sky a range of stone devices were created all over the globe that evolved into some of the greatest temples and monuments of the prehistoric world.

Ancient Tool Kit

Ancient ancestors hacked a living in the raw and unforgiving outdoors and without books and televisions to distract them from the sometimes-mundane passing of time, they would often marvel at the cycles of the planets and stars, much more than is practiced today. Tracking the paths of the Sun, the Moon and the stars across the sky, they observed that the planet's poles are inclined from the celestial plane, implying that two solstices occur bi-annually when the solar declination reaches the Tropic of Cancer in the north and the Tropic of Capricorn in the south.

During the June solstice (June 20 to June 22) the solar declination is about 23.5°N (the Tropic of Cancer) and during the December solstice (December 20 to December 23), the solar declination is about 23.5°S (the Tropic of Capricorn). This means the solstices, and shifting solar declinations, result from the Earth's 23.5° axial tilt, while orbiting the sun. The resulting summer or June solstice in the Northern hemisphere is the longest day of the year, when Earth experiences the maximum intensity of sun rays, therefore, it has the most hours of sunlight. The opposite is the case for the December or winter solstice which is the shortest day of the year with the least hours of daylight.

The situation is reversed for the Southern hemisphere where the June solstice heralds the shortest day in winter and the December solstice falls in the high summer. In both hemispheres, from the March equinox it presently takes 92.75 days until the June solstice; 93.65 days until the September equinox; 89.85 days until the December solstice and 88.99 days until the March equinox.

Today, the two solstices mark the beginning of winter and summer, but this was not always the case in the earliest human cultures. An entry in the National Geographic resource library explains that some ancient cultures only recognized two seasons (there was no autumn or spring), so the solstices occurred in the middle of the season. This is why solstices are known as midwinter and midsummer respectively, and why since ancient times many cultures have marked the solstices with elaborate rituals and sacrifices, which evolved into celebrations and festivals and ended up as modern calendar holidays.

Midwinter Celebrations

OnIntuitively one might assume that the midwinter solstice represented misery, hardship and death, but many ancient solar traditions honored and celebrated the winter solstice, which despite occurring in the cold, winter season, indicated the return of light. All over the ancient world Northern hemisphere December solstice festivities emphasized light and with the winter solstice being the shortest, darkest day of the year, it also symbolized the beginning of newfound life, hope and future health.

Perhaps the most famous midwinter observatory, and later festival site, is England's Stonehenge. This iconic ancient stone circle features the Heel Stone, which marks the June solstice sunrise. Every year on the June solstice thousands of people travel to Wiltshire, England, where the huge stone circle that was raised around 3000 BC becomes a focus for solar worship marking the relationships between the sun and the changing seasons.

The use of a single large menhir to mark the azimuth (angle) of solstice and equinox sunrises and sunsets was relatively common across the ancient world. This astronomical dynamic, code or device is also seen the at the Inca ruin of Machu Picchu, in the Urubamba Valley in Peru, where the Intihuatana Stone (hitching post of the sun) marks the December solstice. Furthermore, this stone is positioned so that each corner points towards one of the four cardinal points (north, south, east, and west). The location was a deeply sacred gathering spot where people observed the solstice sun and danced and prayed for their survival through the rest of the resource-threatening winter.

The midwinter solstice was celebrated in Ancient Rome with the Saturnalia festival, in honor of the god Saturn, that began on December 17 (Julian calendar) up to the actual solstice event around December 21, during which time the entire population of the empire, both rich and poor, went momentarily crazy, unbridled and pure feral. According to historian John F Miller in his 2010 book Roman Festivals during Saturnalia festivities, Romans enjoyed banquets, gambling, jokes, gifts, and a tradition "of usurping strict social structures," for example, elites served food to their slaves. On a religious level, the earliest Christians celebrated Saturnalia for Advent and

19th-century painting, The Vintage Festival by Lawrence Alma-Tadema

An example of Roman Festival Lupercalia.

A part of the Ring of Brogar (© NilsZ)

Villa Adriana, near Rome, The Villa of Adrian Emperor (© marcorubino)

Christmas while Pagans and neopagans directed their celebrations towards the winter solstice as Yule. In both Pagan and Christian traditions people born on December 25 were thought of as having been born with the Sun and perhaps no better an omen could surround one's birth.

Hadrian's Hideout

Eric Hand's article published in Nature, titled The Emperor's country estate is aligned to meet the solstices explains that the Roccabruna at Hadrian's Villa, located 30 kilometers (18 miles) east of Rome, was "a place where the Roman Emperor could relax in marble baths and forget about the burdens of power." Dr Marina De Franceschini, an Italian archaeologist from the University of Trento in Italy, wrote a paper in which she credited two architects, Robert Mangurian and Mary-Ann Ray, for noticing a solstice light effect and that the villa's buildings

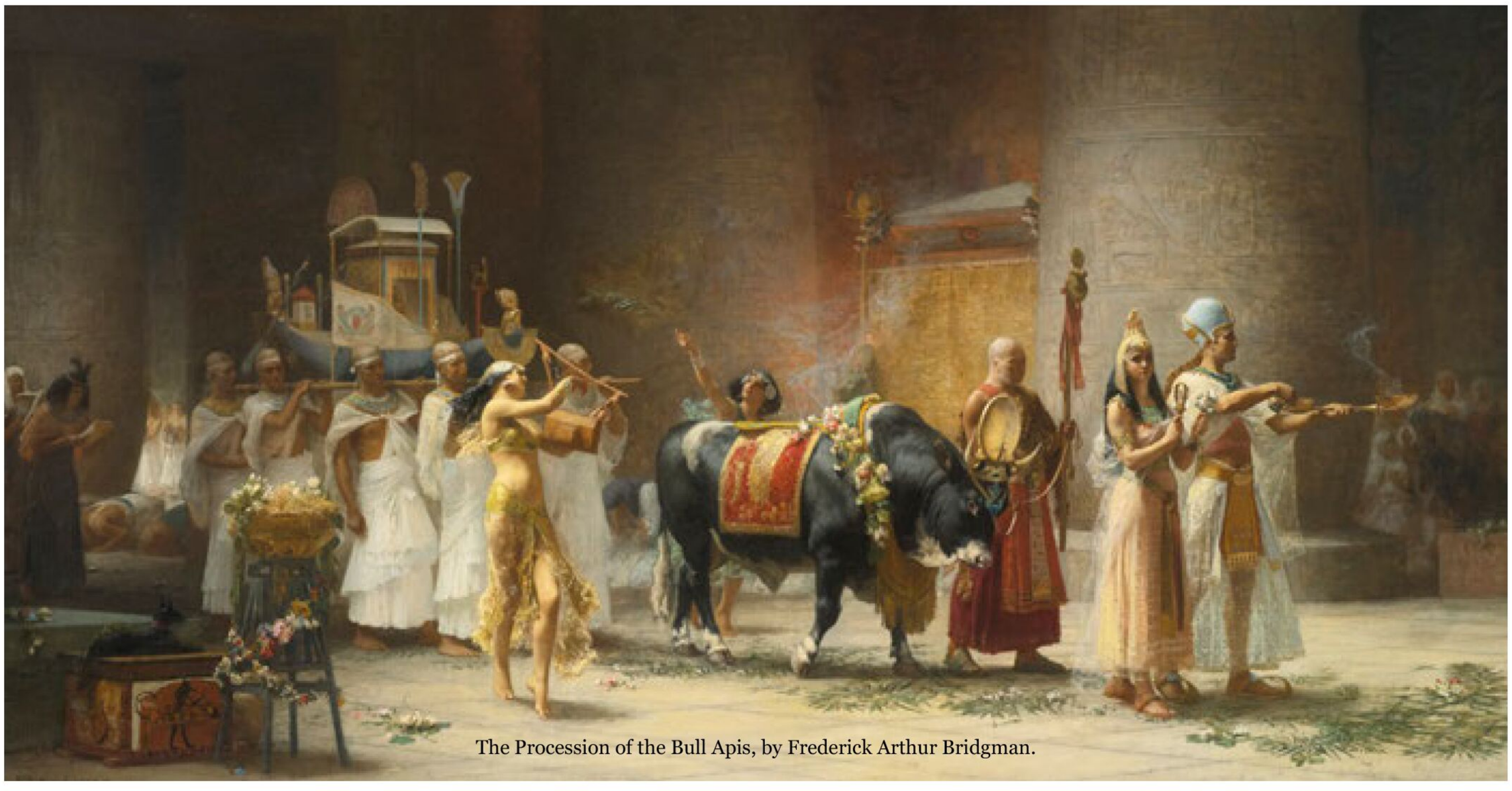
Pompeii, Temple of Isis, Io and Isis.

are aligned so as to produce sunlight effects for the seasons. An example of these solstice angles in the architecture of the villa is that during the summer solstice, “blades of light pierce two of the villa’s buildings on the summer solstice through a wedge-shaped slot above the door and illuminates a niche on the opposite side of the interior.” Furthermore, in a temple of the Academia building, De Franceschini measured the archaeoastronomy within the two buildings and discovered sunlight passes through a series of doors during both the winter and summer solstices.

Devoid of spiritualized meaning, in dry reality, the solstice and equinox events are but fleeting moments when a star emerges from and sets behind a horizon, until however, an architect or builder manifests the moment in stone. De Franceschini says that the two buildings at Hadrian’s villa are connected by an esplanade “that was a sacred avenue during the solstices which were linked to religious ceremonies associated with the Egyptian goddess Isis, who was adopted by the Romans.”

Archaeoastronomy in Egypt

In Ancient Egypt the summer solstice signaled the beginning of the new year, the peak of



The Procession of the Bull Apis, by Frederick Arthur Bridgman.

hunting activity, agricultural fertility, and the approach of the all-important harvest season. Therefore, midsummer festivals were celebrations of nature's bounty and life-giving energies were personified in a range of solar deities. Sirius is the highest magnitude (brightest) star in the night sky and because it appeared soon after the summer solstice astronomers associated its annual appearance with the seasonal flooding of the Nile River, upon which the entire Ancient Egyptian civilization depended for its continued survival.

On the midwinter sunrise the Egyptians celebrated the rebirth of the god Horus and the celebrations lasted for 12 days during which time they decorated their homes with plants and vegetables to welcome in a prosperous and bountiful new year. On an archaeoastronomical level, an October 2020 Egypt Today article notes that "every year, scientists renew their interest in the astounding progress that the pharaohs of ancient Egypt reached in the field of astronomy, thanks to the sun alignment phenomenon, where the sun illuminates the face of Ramses II statue in Abu Simbel." This occurrence was first observed at sunrise on December 22, 1874, and lasted only 20 minutes, but it was noted that "the sun-rays penetrated the entrance to the temple, until they reached a small room that contained a number of statues."

© WD Stock Photos

Solstice Architecture in British Isles

In Scotland and Ireland around 3200 BC ancient farmers built huge stone mounds aligned with the solstices, for example, Maeshowe in Orkney and Newgrange in Ireland. The latter is a mound in the Boyne Valley, County Meath, Ireland, measuring 85 meters (279 feet) in diameter and 13 meters (43 feet) high, covering an area of about one acre. For five days around the winter solstice a narrow beam of light penetrates a roof-box above the front portal and it gradually extends to the rear of the chamber where it illuminates the entire inner chamber, dramatically, for about 17 minutes before the sun rises and the event ends.

Nabta Playa in Africa

Perhaps the tidiest way to wrap up an overview of the world's astronomical marvels that all paid homage to the four quarters of the year, is a visit to the first known astronomical site on the planet, Nabta Playa in Africa. This 7,000-year-old stone circle not only tracked the summer solstice and the equinoxes, but also the arrival of the annual monsoon season, just as the Maya pyramid serpents and Angkor Wat's temple towers indicated 6,000 years later. Nabta Playa stands some 700 miles (1,126 kilometers) south of the Great Pyramid of Giza in Egypt and represents possibly Earth's oldest astronomical observatory ever discovered. It was constructed by a cattle-worshiping cult of nomadic people to mark the summer solstice and the arrival of the monsoons. Dr J. McKim Malville professor emeritus at the University of Colorado and an archaeoastronomer wrote in Astronomy that this site is, "human beings' first attempt to make some serious connection with the heavens" and he added that this site also represents the dawn of observational astronomy.
Dr Malville experienced an epiphany when

View of Nabta Playa stone circle.

Equinox Monuments In Mesoamerica

In Latin the word equinox means “equal night” representing the two days of the year when there are 12 hours of light and darkness, around March 21 and September 21. An article in The Old Farmers’ Almanac presents Chichen Itza in Mexico as a vast Maya equinox monument, a huge pyramid built around the year 1000 AD that signals the beginning of the seasons. On the spring equinox the rising and setting sun animates the architecture when a serpentine shadow is seen moving along the edges of the structure on the Maya festival day “the return of the Sun serpent.” During the spring and fall equinoxes the pyramid dedicated to Kukulcán (or Quetzalcoatl) serves as a visual symbol of the day and night. On every equinox, the sun of the late afternoon creates the illusion of a snake creeping slowly down the northern staircase. Symbolically, the feathered serpent joins the heavens, earth and the underworld, day and night. Seven shadow triangles on the side of the staircase connect the top platform with the giant stone head of the feathered serpent at the bottom. Like Stonehenge in England, thousands of pilgrims travel from around the world to Chichen Itza every year to witness this astronomical spectacle.

he discovered that these remote sand blasted stones formed part of an alignment that radiated out from a major tumulus.

What did the first sky watchers think about what must have been exceptionally mysterious lights in the sky? Mysterious, in that they followed patterns that could be replicated on earth, and in these shapes the blueprint for all astronomy, architecture, design and worship evolved, as the square. But how exactly were the lights in the sky perceived? Surely, in an ancient, animated world, the stones themselves must have been considered as the gods’ consorts on Earth? And those deep black shadows that were cast on the sunrises and sunsets on the two equinoxes and solstices might have been perceived as the gods themselves manifesting on Earth, and it was along those shadows that ropes were pulled and sacred stone sites and temples were raised in honor of the great cosmic square. ■

Pentre Ifan (Welsh for Ifan’s village) is an ancient dolmen in the community and parish of Nevern, Pembrokeshire, Wales. (© Helen Hotson)

ooseman/AdobeStock

A starry solution to the Stonehenge Enigma

BY PAUL BURLEY

There is something peculiar about Stonehenge. It is the most renowned prehistoric structure in all Europe. The large stones (megaliths) forming the circular central portion of the monument have been studied by historians, antiquarians and scientists for many centuries. Yet the cumulative time, effort and money put into understanding why the monument was built has produced few results.Curiously little can be said of the original purpose of the structure. Certain pairs of stones appear to align with specific solar or lunar events on the horizon. Events such as alignment of the central axis of Stonehenge with the rising summer solstice sun are essentially unchanged since the stones were first placed in about 2480 BC. Yet Stonehenge is not an astro-

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nomical observatory. Would you construct a building out of 80,000 pound blocks of stone with the odd chance that some of the stones might align with a specific solar event? I certainly wouldn't. Two wood posts set into the ground will do just fine, thank you. Can this conclusion be correct? Did people living in late Neolithic Britain have little interest in stars? Is it possible that unlike everyone else, their cosmology and mythology were limited to addressing only solar and lunar phenomena seen on the horizon? And is this limitation reflected in the monumental architecture they left behind? Common sense tells us this simply cannot be. Given the little evidence we have, to conclude that Stonehenge is a temple dedicated to astronomical observations only along the horizon seems like intellectual fraud. Rather, the current body of evidence is insufficient to draw such conclusion. Yet both the scientific community and population in general appear to accept that use of Stonehenge had nothing to do with the cosmic dome.

Did Neolithic Britian Really Miss the Milky Way?

In Maya and Andean cultures, among many others across the Americas, the Milky Way was known to impart both spirit and power to all life, animate and inanimate. Appearing from Earth as a bright astral ring surrounding Earth, the galaxy intersects the path of the Sun. The path is called the ecliptic. This intersection forms two cosmic or galactic crosses in the night sky. One crossing point is between Taurus and

Gemini, the other between Scorpio and Sagittarius. The two locations are precisely opposite each other on the cosmic sphere surrounding Earth.
Maya and Andean astronomers observed the two crossing points over thousands of years. The locations represented centers of two cosmic trees - trees of life and death. They were pathways for the spirit of life to travel from the stars to Earth, then return to the stars upon death of the body.
The Milky Way was visualized by many ancient and indigenous cultures as the universal snake or Cosmic Monster. Like almost all living things, it expressed aspects of male and female. It was androgynous. The constellation of Orion between Gemini and Taurus was perceived in human form, holding one of the galactic crosses in the right hand. Orion represented the male as Osiris, Shiva, Mercury, Thor, Lugh, the Maize God, and many other gods. The constellation also represented female goddesses as Isis, Parvati, Inanna, Aphrodite, Athena, and many others.
These gods and goddesses represented fertility, prosperity and happiness, as well as warfare, destruction and death. Each played part in the eternal cycle of creation and destruction of all things. The Milky Way represented this cycle. The galaxy wound about Orion who was held by the arm, the Cosmic Monster and dual aspects of human beings together orbiting Earth forever.
The intersection of the ecliptic and Milky Way between Scorpio and Sagittarius is the center of the Southern Cross. This is where spirits of the dead entered the Underworld and begin their journey up the tree along the ‘White Road’. The spirit’s objective was the womb of the world – the region of the asterism known as the Winter Hexagon – where the Northern Cross is held in the hand of Orion. Here the spirit returned to the stars with the possibility of another journey to Earth at some later time.
In ancient Europe, the universal mother holding one or more infants was represented by the constellation of Auriga. The constellation was also perceived as a shepherd holding a lamb or lambs. From here the spirit of a newly conceived life began its journey along the Milky Way, the Tree of Life, to Earth. And where did

Mårten Eskil Winge, Tor's Fight with the Giants.

the spirit step from the Milky Way to Earth? The answer is the star Sirius, brightest star in the sky and located along the Milky Way along the alignment of Capella, brightest star in Auriga, and the center of the Northern Cross.
You might be asking yourself what this has to do with Stonehenge. The answer is a lot. Unbeknownst to many historians, antiquarians and archaeologists searching for solutions to Stonehenge's mysteries, the center star of Orion's three belt stars is Alnilam. That star is located at a declination of -01 o 12' 06.9", meaning it is about one degree south of the celestial equator. The celestial equator is simply the earth's equator projected out to the cosmic sphere surrounding Earth.
The celestial equator can be envisioned as an unseen circle rotating around Earth once every 24 hours. Every star in the sky appears to rotate around Earth once every 24 hours. Astronomers identify the location of each star relative to the position of the vernal equinox, which happens to be the center of the Northern Cross. Looking at that location in the sky, Alnilam is to the right of the vernal equinox; it has a right ascension of 5 h 36 m 12.8 s.

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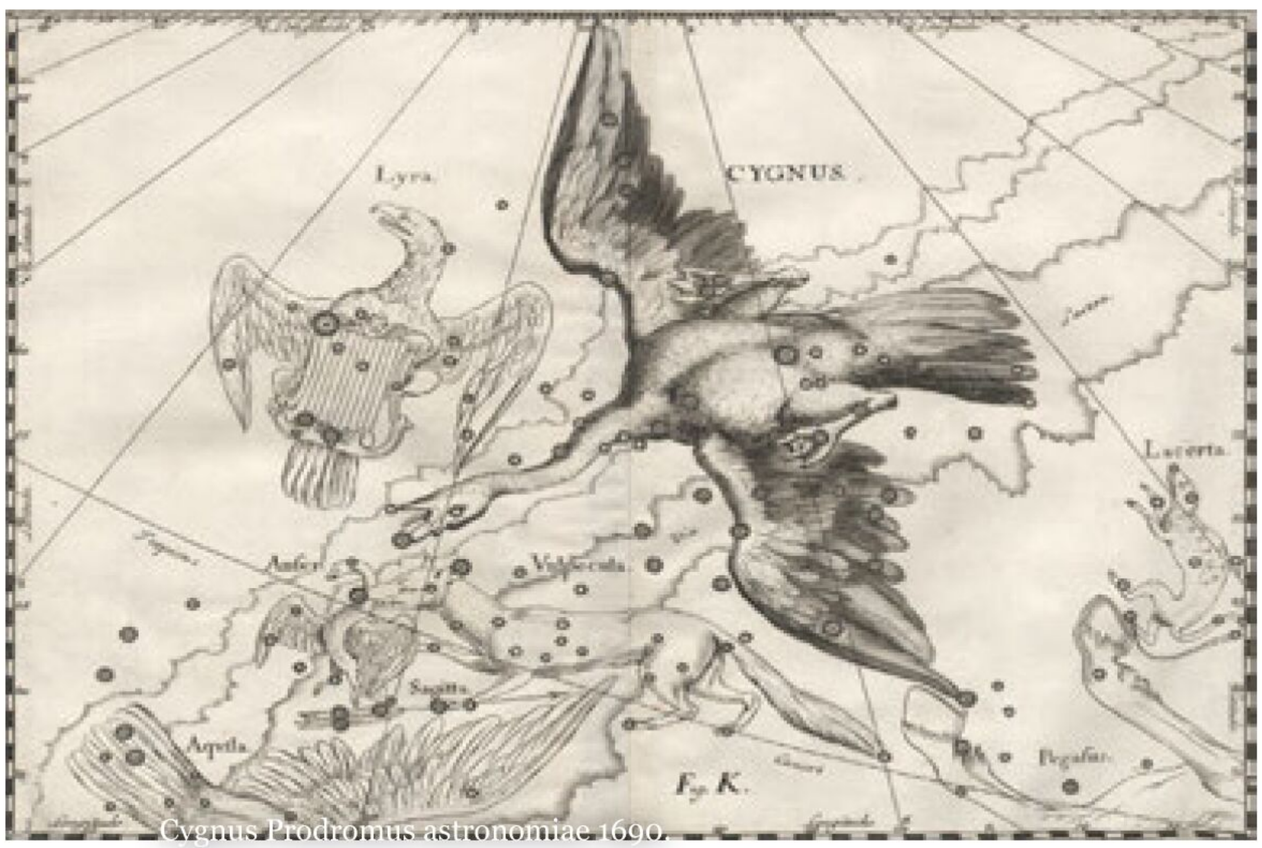
In other words if the length of the celestial equator measured in time is 24 hours, Alnilam is 5 hours, 36 minutes, 12.8 seconds to the right of the centre of the Northern Cross. Here is where this gets really interesting. The brightest star in Taurus is Aldebaran.
Its location is declination +16 o 30’ 33.49”, right ascension 4 h 35 m 55.24 s. Meanwhile, Sirius – the brightest star in the sky – is located at -16 o 42’ 58.15 ”, right ascension 6 h 45 m 8.92 s. Studying the numbers we find that the declination of Alnilam is only -0 o 12’ 24.26”, right ascension 0h 10m 30.72s from the center point between Sirius and Aldebaran. In fact, from the standpoint of naked eye astronomy Alnilam is at that center point!
If the astronomy is causing you more confusion, here is the connection to Stonehenge. During the summer of 2013 I analyzed the spatial relationships of Neolithic monuments constructed within about 2 miles (3.3 km) of Stonehenge. In doing so it was found that scaled positions of the part of the night sky including the Northern Cross, Orion, Auriga, Taurus and Sirius plot such that long barrow Amesbury 42, the Heelstone at Stonehenge, the center of Woodhenge, Coneybury Henge



Cygnus Prodromus astronomiae 1690.

Pleiades Stars.

and the west end of the Greater Cursus match the map of stars. Plainly, the landscape of monuments constructed 1000 years before megaliths were placed at Stonehenge represents a map of the cosmic area where the spirit of each life comes from, and returns to.

But what of Stonehenge itself? There are four specific locations at Stonehenge each of which was the site of a megalith when the circles of stones were placed in about 2480 BC. The four stones are called the Station Stones. They formed the corners of a near-rectangular area surrounding the central portion of the monument. The Station Stones are numbered 91 through 94. Stone 91 is opposite of stone 92, and stone 92 is opposite of stone 94.

Again, results of analysis conducted in 2013 shows that the Station Stone quadrilateral represents the portion of night sky between Aldebaran and Sirius. Stone 92 represents Aldebaran, and stone 94 represents Sirius. Where does Alnilam, center star of Orion's belt plot? At the center of the monument. Emplacing Orion upon Earth at Stonehenge, the symbolism is clear. The monument represents the cosmos and Earth brought together to create life in spirit and body.

The surrounding landscape represents the source and place of return of the spirit. Just as the body upon death is returned to Earth, the spirit is released to return to the stars. The cycle of birth, life, death and rebirth continues without end, conforming to creation, destruction and re-creation of the universe itself.

In the end, what is peculiar about Stonehenge is not its architecture nor its purpose, but our inability until now to recognize what it represented for the people of Britain 4500 and more years ago. It is part of the cycle of life. ■

Paul D. Burley is the author of 'Stonehenge: As Above, So Below', published March 2014 by New Generation Publishing, London.

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Avebury's

Revolutionary archaeoastronomical research is revealing that Avebury stone circle was far more than a religious monument - it was more likely a sophisticated celestial observatory that encoded complex astronomical knowledge in stone. New discoveries suggest our Neolithic ancestors possessed advanced understanding of lunar cycles, solar movements, and star patterns, transforming our perception of prehistoric intelligence. These theories claim the world's largest stone circle holds cosmic secrets, and are now aiming to demonstrate just how ancient Britons used megalithic architecture to map the heavens with stunning precision.Recent investigations at this 4,500-year-old monument in Wiltshire have uncovered intricate astronomical alignments that demonstrate remarkable sophistication in Neolithic astronomical observation. Ground-penetrating radar surveys by the University of Leicester have revealed previously unknown stone arrangements, including a mysterious rectangular enclosure that may have served as the original observation platform from which all subsequent astronomical calculations were made.

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Celestial Secrets:

Did Ancient Astronomers Encode the Cosmos in Stone?

BY GARY MANNERS

Old photo of Silbury Hill excavation.

The Monument That Dwarfs Stonehenge

Covering an impressive 28 acres with originally 427 massive sarsen stones, Avebury is three times larger than its more famous neighbor Stonehenge. The monument consists of a great outer circle containing two smaller inner circles, all enclosed within a massive chalk bank and ditch system. Construction began around 3300 BC and continued for nearly 700 years, representing one of humanity's earliest large-scale engineering projects.

Unlike Stonehenge's restricted access, Avebury's stones stand among houses and roads in the modern village, creating a unique living archaeological landscape. The monument's sheer scale suggests it served as a regional center of astronomical and ritual activity, drawing people from across Neolithic Britain to participate in sophisticated celestial observations.

Archaeological evidence indicates the site was constructed from the inside out, beginning with careful astronomical observations from a central rectangular enclosure. This methodical approach challenges traditional assumptions about prehistoric monument building

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and claims a level of planning sophistication previously unrecognized in Neolithic Britain.

Traditional Views: Temple, Marketplace, or Sacred Center?

For over three centuries, archaeologists have debated Avebury's original purpose, with interpretations evolving significantly as new evidence emerges. Early antiquarian William Stukeley, writing in the 1740s, believed Avebury was a serpent temple dedicated to ancient Druidic worship. His influential work "Abury, A Temple of the British Druids" established the monument's reputation as a religious site, though his Druidic connections have been thoroughly debunked by modern archaeology.

Twentieth-century archaeologists like Alexander Keiller, who restored much of the site in the 1930s, interpreted Avebury primarily as a ceremonial complex where Neolithic communities gathered for religious rituals and social activities. This view dominated academic

thinking for decades, portraying the monument as a temple where ancient Britons conducted seasonal ceremonies and ancestor worship. But other ideas have emerged.

More recent traditional interpretations have emphasized Avebury's role as a gathering place for dispersed farming communities. Archaeologists suggested the massive earthwork served as a neutral meeting ground where different tribal groups could trade goods, arrange marriages, and participate in collective rituals that reinforced social bonds. The monument's central location in the fertile Kennet Valley supports this interpretation, as did evidence of extensive Neolithic settlement throughout the surrounding landscape.

Some researchers proposed that Avebury functioned as an ancient marketplace or fair site, where seasonal gatherings brought together people from across prehistoric Britain. The vast enclosed space could accommodate thousands of participants, while the impressive stone circles provided a dramatic backdrop for important social and economic activities. This theory explained the site's enormous scale and the significant investment of labor required for its construction.

Finding Astronomical Alignments

Recent research has identified multiple potential astronomical alignments built into Avebury's architecture. The two inner stone circles originally comprised 29 and 27 stones respectively - numbers that precisely match the days in synodic and sidereal lunar months, notes Freddy Silva in an article. The outer circle's 99 stones, combined with 8 attendant stones, create a 107-stone total that may represent the calibration period for lunar-solar calendars every eight years.

Computer modeling of ancient skies reveals that specific stone alignments likely marked crucial astronomical events. Stone 106 of the South Circle was positioned to align with the central Obelisk such that winter solstice sunrises could be precisely observed. The West Kennet Avenue stones create paired alignments that track lunar standstill positions - the extreme northern and southern positions of moonrise and moonset that occur every 18.6 years.

The monument's relationship with surrounding landscape features adds another layer of astronomical sophistication. From the central obelisk position, Silbury Hill's summit appears through a carefully

Reimar/AdobeStock

engineered V-notch in Avebury's embankment. During the spring equinox circa 3000 BC, the brilliant star Sirius appeared directly above this alignment, with the constellation Orion positioned nearby. Hours later, the Milky Way would roll across the sky to mirror the slope of nearby Waden Hill, creating a dramatic representation of "As Above, So Below" cosmology.

Computer analysis suggests that the rectangular enclosure's orientation marks both lunar standstill extremes and solstice positions, providing a central observation platform from which ancient astronomers could track celestial cycles with remarkable precision. The structure's alignment with Sirius rising and its relationship to surrounding monuments indicates sophisticated understanding of both stellar and planetary motions.

Avebury functioned as the centerpiece of a vast ritual landscape that included West Kennet Long Barrow, Silbury Hill, and numerous other megalithic monuments. This integrated complex suggests coordinated astronomical observations across multiple sites, creating what researchers now

recognize as Europe's earliest astronomical observatory network.

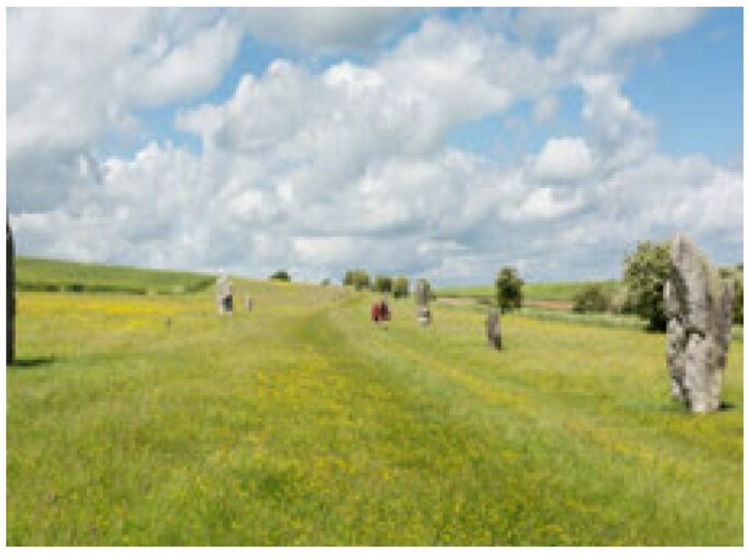
The West Kennet Avenue, a 1.5-mile (2.2km) stone-lined processional way connecting Avebury to other monuments, contains its own astronomical alignments. Stone pairs along the avenue mark lunar standstill positions and seasonal solar events, transforming the entire landscape into a giant astronomical calculator. Participants could walk between monuments while observing celestial events marked by stone alignments, creating a physical and spiritual journey through cosmic cycles.

Ground-penetrating radar has revealed that the mysterious rectangular enclosure near Avebury's center predates the main monument by up to 1,000 years. This 98-foot-long (30m) structure, marked by an 18-foot tall (5.5m) obelisk, may have served as the original observation platform where Neolithic astronomers made the careful measurements that eventually guided construction of the entire complex. The discovery suggests that Avebury's astronomical knowledge accumulated over many generations before being encoded in the final stone arrangement.

The integration of multiple monument types - henges, stone circles, burial chambers, and artificial hills - creates a landscape where astronomical observations could be coordinated across vast distances. Recent surveys suggest that intervisibility between sites was carefully planned, allowing communities to synchronize their observations and share astronomical knowledge across the region.

Modern Discoveries Rewrite Ancient History

Twenty-first century technology is revolutionizing our understanding of Avebury's astronomical capabilities, and an impressive amount of data has been gathered at the site is. Ground-penetrating radar surveys have revealed numerous buried stones and previously unknown structural features that enhance the monument's astronomical functions. Laser scanning and 3D modeling allow researchers to recreate ancient sky views with unprecedented accuracy, confirming



alignment theories first proposed by eighteenth-century antiquarian William Stukeley.

Recent geophysical surveys have identified a smaller rectangle within the larger enclosure, possibly erected around 3600 BC - making it one of Britain's earliest known astronomical observation structures. This finding supports theories that Avebury represents centuries of accumulated astronomical knowledge, with each generation adding to their predecessors' celestial observations.

Computer analysis of stone positions reveals statistical correlations with astronomical events that exceed chance probability. Multiple stones align with lunar standstill positions, solstice sunrises and sunsets, and specific star patterns. The precision of these alignments, combined with the monument's massive scale, demonstrates that Neolithic Britons possessed sophisticated understanding of celestial mechanics centuries before written records.

The discovery of the earlier rectangular structure has prompted reassessment of Avebury's development sequence. Rather than a single construction campaign, the monument appears to represent millennia of continuous astronomical observation and refinement. Each generation of users may have added new elements based on their enhanced understanding of celestial cycles, creating an increasingly sophisticated observatory.

Archaeological evidence suggests Avebury remained astronomically active throughout the Bronze Age, with continued modifications and additions reflecting evolving celestial knowledge.

The monument's longevity demonstrates that astronomical observation was central to ancient British culture for over two millennia, creating an unbroken tradition of sky-watching that predates classical astronomy by thousands of years.

Evaluating the Evidence: How Reliable Are These Findings?

While the astronomical interpretations of Avebury present compelling evidence for sophisticated Neolithic sky-watching, several factors should be considered when evaluating these

Portrait of William Stukeley.

claims. The statistical significance of astronomical alignments remains a contentious issue in archaeoastronomy, with critics arguing that enough potential celestial targets exist to create apparent alignments by chance alone.

English Heritage's Dr. Heather Sebire acknowledges that while some alignments appear intentional, "we must be cautious about reading too much astronomical significance into every stone placement." The challenge lies in distinguishing deliberate astronomical orientations from coincidental alignments that inevitably occur in any large stone arrangement.

The reliability of computer modeling for ancient sky positions depends heavily on accurate dating of individual stones and structures. While radiocarbon dating provides general chronological frameworks, the precise construction sequence of Avebury's various elements remains uncertain. Small errors in dating can significantly affect calculations of ancient astronomical alignments, potentially undermining theories based on specific celestial events.

Ground-penetrating radar and geophysical surveys have undoubtedly revealed new structural details, but interpreting these findings requires careful correlation with archaeological excavation. The rectangular enclosure's astronomical function, while plausible, remains theoretical without additional evidence of its use for celestial observations. Archaeological excavation would be needed to confirm whether post-holes and stone sockets align with proposed astronomical orientations.

The integration of Avebury with surrounding monuments strengthens astronomical interpretations, as coordinated alignments across multiple sites would be difficult to achieve by chance. However, landscape-scale theories require extensive survey work to verify proposed sightlines and intervisibility patterns. Some claimed alignments may be compromised by ancient vegetation or topographical changes not visible in modern surveys.

However, recent peer-reviewed research by Cambridge archaeologists has applied rigorous statistical methods to Avebury's alignments, confirming that certain orientations significantly exceed chance probability. These studies lend credibility to astronomical interpretations while acknowledging limitations in our understanding of Neolithic observational practices and cultural meanings attached to celestial events. ■

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NEWGRANGE AND THE BOYNE VALLEY MONUMENTS:

ADVANCED LUNAR CALCULATIONS AND OBSERVATION IN NEOLITHIC IRELAND

BY ANTHONY MURPHY

Near the east coast of Drogheda, about 30 miles north of the Irish capital city, Dublin, lie the remains of a vast prehistoric monumental landscape. Newgrange and its sister sites at the Brú na Bóinne complex were built more than 5,000 years ago. These giant stone edifices survive today, along with a smattering of other smaller archaeological monuments. Archaeologists say Newgrange, Knowth and Dowth were tombs, built in ancient times to provide somewhere to bury the dead. And yet, the passage and chamber of Newgrange are aligned so that the beams of the winter solstice sun enter the deepest part of the chamber at dawn on the shortest days of the year. This is accepted as a key aspect of the design of Newgrange and

is not something that happens by chance. In addition to the fact that the chamber of Newgrange accepts sunlight at dawn on winter solstice, there are several other aspects of its design, its alignments, its cosmology and its mythology that command the attention of those exploring its true functions. And there are several aspects of Newgrange that remain a puzzle to archaeologists. Up until 1967, after archaeological excavation, conservation and restoration work, it was not possible for the light of the sun to illuminate the interior. This was due to slow subsidence of the roofing stones of the passage, which had slowly sunk as the supporting orthostats leaned inwards over the long centuries. Before 1967, when archaeologist Professor Michael O'Kelly became the first person to witness the solstice event in modern times, nobody could have witnessed

this phenomenon. And yet, local folklore held that the sun shone into Newgrange on the shortest day of the year. O'Kelly points to this as being one of the reasons for his visit to the chamber in December 1967 when he became the first person to witness the alignment in the modern era. But the astronomical mysteries of Newgrange run much deeper than all this. In 1958, in his book about primitive mythology, Joseph Campbell recounted a folk tale from the Boyne Valley in which a local had told him the light of the Morning Star, Venus, shone into the chamber of Newgrange at dawn on one day every eight years and cast a beam upon a stone on the floor of the chamber containing two worn sockets. This might seem like an incredible suggestion, except for the fact that it is astronomically accurate. Venus follows an eight-year cycle and one year out of every eight it rises in the pre-dawn sky of winter solstice, and its light would be able to be seen from within the chamber. Christopher Knight and Robert Lomas, authors of Uriel's Machine, suggest that a series of eight x-shaped markings on the lintel stone of the aperture above the entrance of Newgrange – the so-called 'roof box' which

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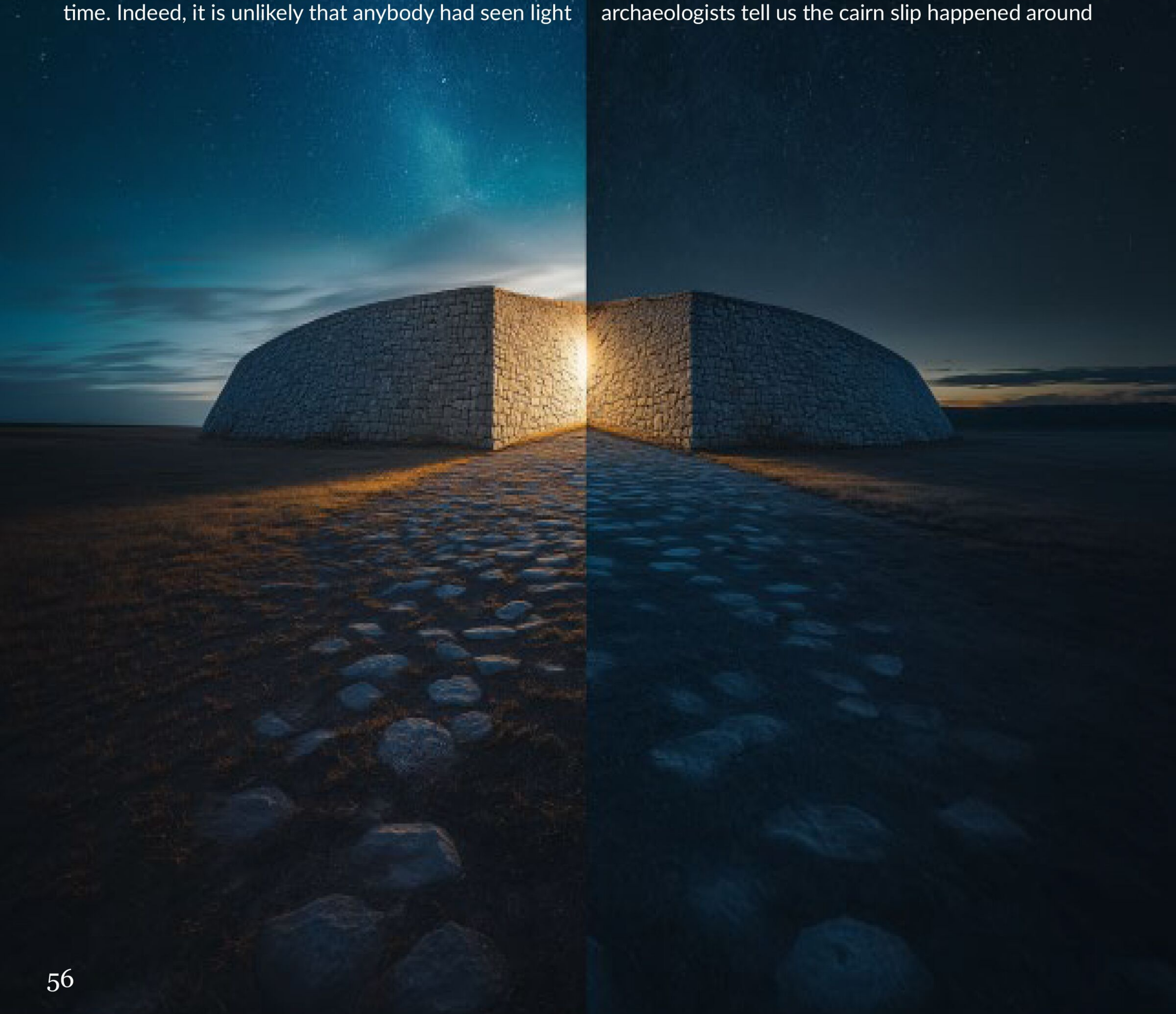
allows light into the chamber – represent the eight-year cycle of Venus. However, they were not aware when writing their wonderful book of the story that had been told to Joseph Campbell about the Morning Star shining into the chamber. How did local people living in the Boyne Valley in the 1950s come into possession of knowledge describing an astronomical phenomenon that was likely to have taken place at Newgrange in the ancient past? This is a question not easily answered by archaeologists. No-one could have witnessed Venus in the chamber of Newgrange in the middle of the twentieth century because not only had the passage roof subsided, but the whole roof box aperture was completely blocked up with soil and grass, as is evidenced from photographs of the time. Indeed, it is unlikely that anybody had seen light from either the sun or Venus shining into the chamber of Newgrange since entrance was rediscovered in 1699. It would have been impossible, given the structural condition of the monument, to view such an occurrence. So how far back did this folklore go, if the penetration of light from the sun or Venus was not observable in the three centuries after the 1699 rediscovery? When Newgrange was excavated in the twentieth century, it was found that a great amount of the cairn had “slipped” over the retaining kerbstones at some remote epoch. All of the great kerbstones – there are 97 in total, each weighing an average of three tones, or the weight of an Asian elephant – had been covered when this collapse occurred, as indeed had been the entrance and the roofbox.Astonishingly, archaeologists tell us the cairn slip happened around



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500 years after the monument was built. Given the estimated construction date of approximately 3150 BC, this means the cairn had slipped around 2650 BC, at that period in time marking the end of the Neolithic and the beginning of the Bronze Age. According to the archaeologists, Newgrange lay hidden for four thousand years. Its appearance was that of a miniature tree-covered hill, with just a few of the outer Great Circle of stones visible.

Considering the Broader Landscape

Let us first briefly look back in time, There is much about Newgrange that is mysterious. A lot of Ireland's myths were written down by Christian monks around a millennium ago. Some of these texts record descriptions of Newgrange including: " Mac an Og's brugh brilliant to approach", "yonder brugh checkered with the many lights" and "the white-topped brugh of the Boyne". If the cairn had slipped in the Bronze Age, as the archaeologists tell us, sweeping the white quartz stone that decorated its front out onto the ground, to be covered by the subsiding rocks and pebbles, are such mythical memories as these recollections of Newgrange as it was in the remote past?

The whole valley is dedicated to the goddess Bóann, or Bóinn, which is a name that means 'white cow'. This white cow goddess gives her name to the river Boyne, which flows around the great peninsula upon which Newgrange, Knowth and Dowth are situated. Of huge significance is the fact that the river would appear to have been considered the earthly reflection of the Milky Way, the bright band

of our galaxy which runs through the night sky. The river is Abhann na Bó Finne. The Milky Way is known in Irish as Bealach/Bóthar na Bó Finne, the Way/Road of the White Cow. Newgrange is known in Irish as Brú na Bóinne, the mansion or womb of Bóinn.

At Knowth, the aptly named 'Calendar Stone', one of its many giant kerb stones, contains markings including crescent and full moons in a counting pattern that appears to enumerate a five-year lunar interval, part of what is known as the Metonic Cycle of the moon, which is 19 years long. There are words for this 19-year cycle in the Irish language. It was supposed to have been discovered by a Greek called Meton in the fifth century BC, and yet there

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the moon to run through its extreme rising and setting points on the horizon and back again. This cycle is also known as the ‘standstill’ cycle, and is 18.6 years long. Alexander Thom, a Scottish engineer who studied hundreds of Britain’s stone circles and found many of them were aligned on lunar risings and settings, maintained that anyone studying the maximum and minimum declinations of the moon (what he called the lunar ‘standstills’) would be able to predict eclipses.

Remarkably, the legend about Dowth tells about a sudden darkness, as if from a total eclipse, falling upon the men of Erin (Ireland) as they built the cairn so that the king, Bresail Bó-Dibad, could reach heaven. The darkness caused them to abandon their task, and the legend said that the place would ever more be known as Dúbhadh (Dowth), which means ‘darkness’.

More Knowledge Than We Could Imagine?

Further to the observation and calculation of complex lunar movements, the mound builders might have perceived the greatest cosmic cycle of them all – precession of the equinoxes. This slow wobble of the earth’s axis over a period of 25,920 years, causes the sun’s equinox and solstice positions to regress westwards through the zodiac, and another obvious result is that the north pole of the sky slowly points out a great circle over that period. We know Polaris as the North Star today, but back in the late Neolithic, the pole star was Thuban in the constellation Draco.

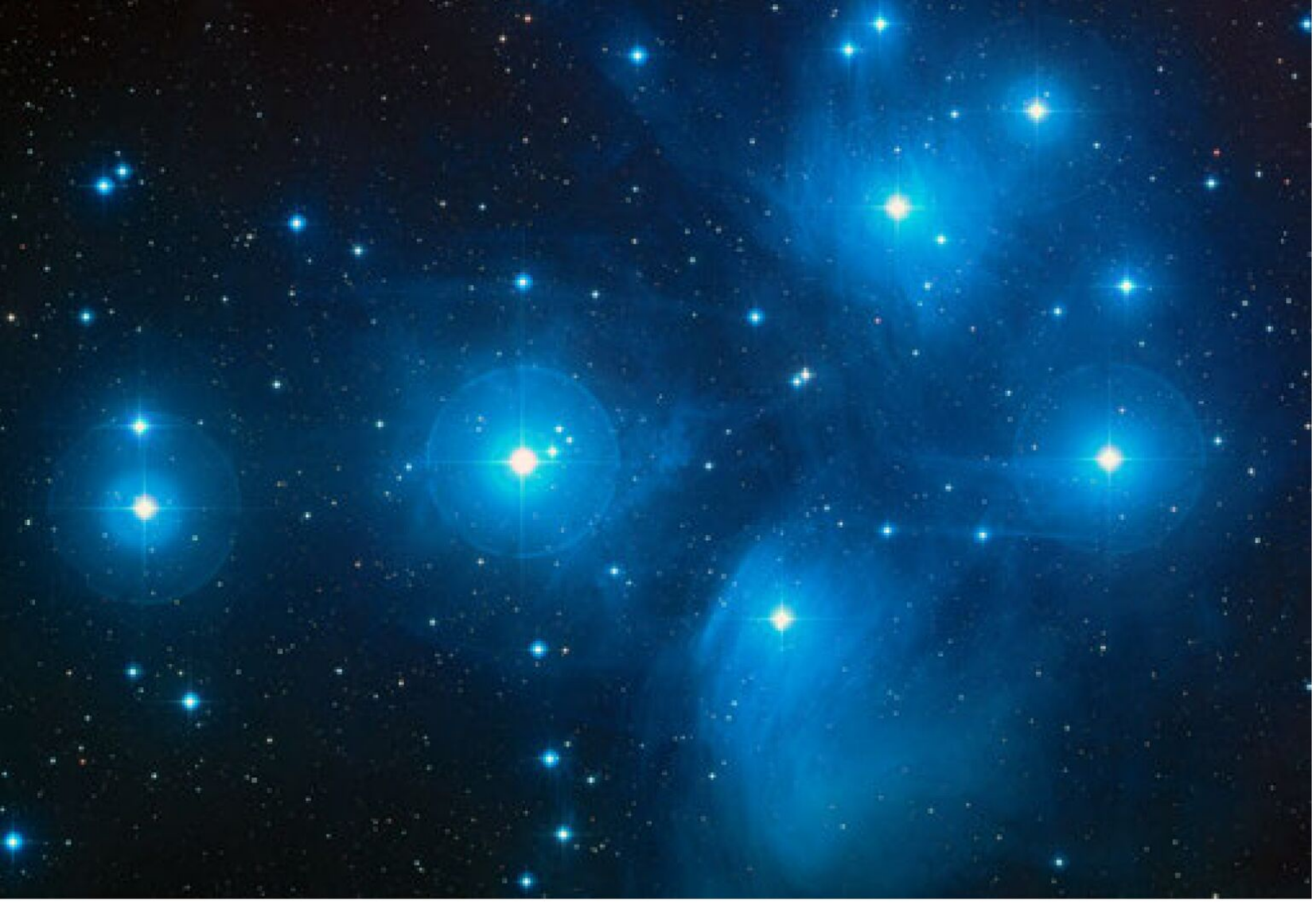
At Dowth, a series of seven sun carvings resemble the Dogon symbol for a heliacal rising. When Dowth was built, the bull constellation, which we know today as

are markings on Knowth’s kerbstones that would indicate it was studied and recorded around 2,800 years before Meton ever existed.

The number of kerb stones at the big monuments could be significant too. At Knowth there are 127 kerb stones, which is half the number of sidereal lunar months in a 19-year Metonic Cycle. In other words, if you count each kerb as a sidereal lunar month, and go once around the whole perimeter, and then back again to where you started, you’d have counted a Metonic Cycle.

At Dowth, there are 115 kerb stones. This is half of 230, which is the number of lunar synodic months in a so-called ‘moon swing’ cycle, the time it takes

Beaghmore Neolithic Stone Circles Tyrone, Northern Ireland. (©peter)



Taurus, would have been rising out of the east, with its small cluster, the Pleiades, or ‘Seven Sisters’, rising due east in the pre-dawn sky of the spring equinox. Is this what the ‘Stone of the Seven Suns’ means?

When Richard Moore and I first suggested this on www.mythicalireland.com back in the year 2000, we were pleasantly surprised at how many people thought that was a good explanation of the stone’s symbolism. But it was much more interesting than that. When you sit with your back to the stone, you are facing to the east, towards the horizon where the Seven Sisters would be appearing in the pre-dawn sky of the Neolithic Vernal Equinox. Of further fascination is the legend of Dowth, which says that it was built on the command of the king, Bresail Bó-Dibad (lacking in cattle) at the time of a great cattle famine which left saw just one bull and seven cows remaining in Ireland. Is this a reference to the bull and its little cluster of seven stars?

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The alignment of the passage of Newgrange towards Red Mountain, where the solstice sun comes up, continues towards another small passage-tomb called Fourknocks, which lies 14.7km (9.1 miles) away. The passage of Fourknocks, in turn, points to the place on the horizon where, around 3000 BC, the bright star of the swan constellation, Cygnus, would have been rising after a brief ‘scrape’ with the horizon.

So Newgrange points to Fourknocks, and Fourknocks pointed to Cygnus in the Neolithic. Fascinatingly, there are a number of myths about swans at Newgrange, the most famous of which features Oengus Óg, the owner of Newgrange, who dreams of a beautiful woman and wastes away out of love sickness for her. Eventually, with the help of his Tuatha Dé Danann family and friends, his lover is found at a lake called Dragon’s Mouth, in Tipperary, where she has taken the form of a swan. Oengus is told he too must transmogrify into a swan in order for them to become lovers. He takes the form of a swan, and they fly to Brú na Bóinne (Newgrange), where they live happily together.

Newgrange is also an important wintering ground for the Whooper

Swans, which come to Ireland every year in large numbers from Iceland. They arrive in October and return to Iceland in March. Ornithologists have long said that Newgrange is one of the most important wintering grounds in Ireland, because it regularly attracts more than fifty birds each winter. Did the ancient mound builders believe that the swans were carrying off the souls of the dead after wintertime, towards the north, perhaps towards that region of the sky in which the great cross-shaped swan constellation was situated?

There are more corroborating factors for this thesis. The passage and chamber of Newgrange are cross-shaped, like the constellation itself. The Cygnus star group sits in the bright band of the Milky Way, as if the swan is gracefully gliding along the surface of this stellar river. Oengus' mother was Bóinn, from whom the river, the Milky Way and indeed the whole valley was named.

At the time Newgrange was built, another remarkable cosmic event was happening. The brightest star in the night sky, Sirius, the one we call the 'dog star', was rising in the same place where winter solstice sun would rise. Its declination placed it firmly in the sky window framed by the roofbox aperture of Newgrange, viewed from its chamber. On a nightly basis, for maybe two thirds of the year, the dog star would 'shine' into the chamber, or at least it would be visible through the entrance by an observer in the chamber. Was it just purely by chance that this was occurring, or was Newgrange designed as a chamber 'of many lights', as the mythology might imply? Was it an observation chamber not just for the sun, but for the moon, the Morning Star and perhaps also the Dog Star as well?

We found that a meaningful interpretation of the true functions of Newgrange, Knowth and Dowth could only come when several aspects and disciplines were studied, including archaeology, astronomy, mythology, spirituality and geodesy, among others. It was only where stars, stones and stories combined that we were able to see a larger picture emerging.

It is a remarkable testament to the builders that their monuments have survived for more than 5,000 years. It is even more remarkable that information about the cosmological significance of these monuments comes to us through the stories associated with them. We have no doubt that some of these stories have come all the way down, through countless generations, from the time that they were built. ■

STARLIGHT AND STONE

TRACKING THE HEAVENS AT CALLANISH

BY MASSIMO BONASORTE

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August 1933, a young engineer, Alexander Thom, anchored his yacht off Lewis and made a shocking discovery. "*On the day of stowing sail, I clearly recollect looking up and seeing the full moon come up over the low ground and there against the orb silhouetted the Stones of Callanish*," he wrote afterward. And this moonlit landing on a place which was also called "the Stonehenge of the Hebrides" was the starting point of a lifetime investigation. The prehistoric skywatching center of Callanish (Gaelic Calanais) is in fact long-established as a famous site. Out on the west coast of the most northerly part of Scotland, the Hebrides, even by modern standards, are a very remote place. And yet there is something here which, thousands of years ago, drew a sufficient population to construct one of the most picturesque and magnificent megalithic monuments in the whole world: the Callanish Stones.

As a matter of fact, it has been labelled as Stonehenge of the North. It is also a very distinctive site since, unlike the familiar surroundings of the majority of megalithic monuments, Callanish is arranged in a circle, comprising 13 stones and 13 meters across, with additional megalithic stones in a Celtic cross form surrounding. It is therefore not monumental in size, but in form. The mean size of the stones, however, is a very great four meters, but they range between one and five; all are local Lewisian gneiss, the oldest kind of stone in Britain, being three billion years old. One may well ask whether our ancestors were aware of how precious this stone was, and whether it was by reason of this that they employed it in this circle.

The stones may have been a cliff at Na Dromannan, a mile inland of Callanish. In this case, some ruined stone circle remains can be seen. Callanish is on the main Island of Lewis, diagonally opposite to Stornoway, which is the modern-day capital of the islands - but which contains a population of just 6,000. Callanish - Callanais in Gaelic, is close to Loch Roag, on a peninsula, on a ridge, so that the surrounding country can be viewed well (except over the top of the natural outcrop, Cnoc an Tursa, on which the stone circle is located, where the

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views to the south become obscured). There are a few platform rocks immediately by the entrance gate which allow one to survey the construction. One wonders whether it was already used this way in ancient times as well. Others suggest that, naturally, the outcrop was to be included in the building, and state that the avenue to the south actually points its course in that direction.

The Megalithic Language

Work on the site started ca. 2900 BC, and the stone circle was made ca. 2200 BC. Gerald and Margaret Ponting believe that the 4.7 meters high, seven tons heavy central stone was erected first. In this case, the site would have started as a massive standing stone. It may then have been equal to another great standing stone - larger than the Callanish stone - on the north side of the island. There, in Balanthrushal, the Clach an Trushal, at six meters high and two meters broad, is the biggest monolith in Scotland, and stands tall today, though crowded in by the modern buildings.

Funnily enough, the center stone of Callanish does not lie in the literal center of the circle. The ring actually is an ellipse of size 13.4 by 11.8 meters. Other avenues also lead to other stone circles, such as Stonehenge. But Callanish is very peculiar since

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its approach is made by lines of stone, from all the cardinal directions, albeit that the avenue in the north is by far the longest, and is one of the few which is a double row. It is 83.2 meters in length along this avenue, and was originally paved with 39 stones, of which 19 are still extant. The terminal stones are placed high and at right angles as though they are blocking stones. The width of the avenue varies between 6.7 and 6 meters.

The southern avenue is strictly north-south oriented and is 27.2 meters. The eastern avenue now has only five stones remaining, and measures 23.3 meters. The one on the west is 13 meters in length, and only contains four stones. There is a subliminal picture in the boundary stone of this western avenue: a head, with a distinct eye and nose, facing inwards, towards the circle of stones. Does it inform us it was a vantage-point, and does it lead us to look to the center of the circle?

The stone circle of Callanish is not the only stone circle in the immediate neighborhood. Less than three-quarters of mile to the east-southeast lie two more stone circles (see Callanish II and III).

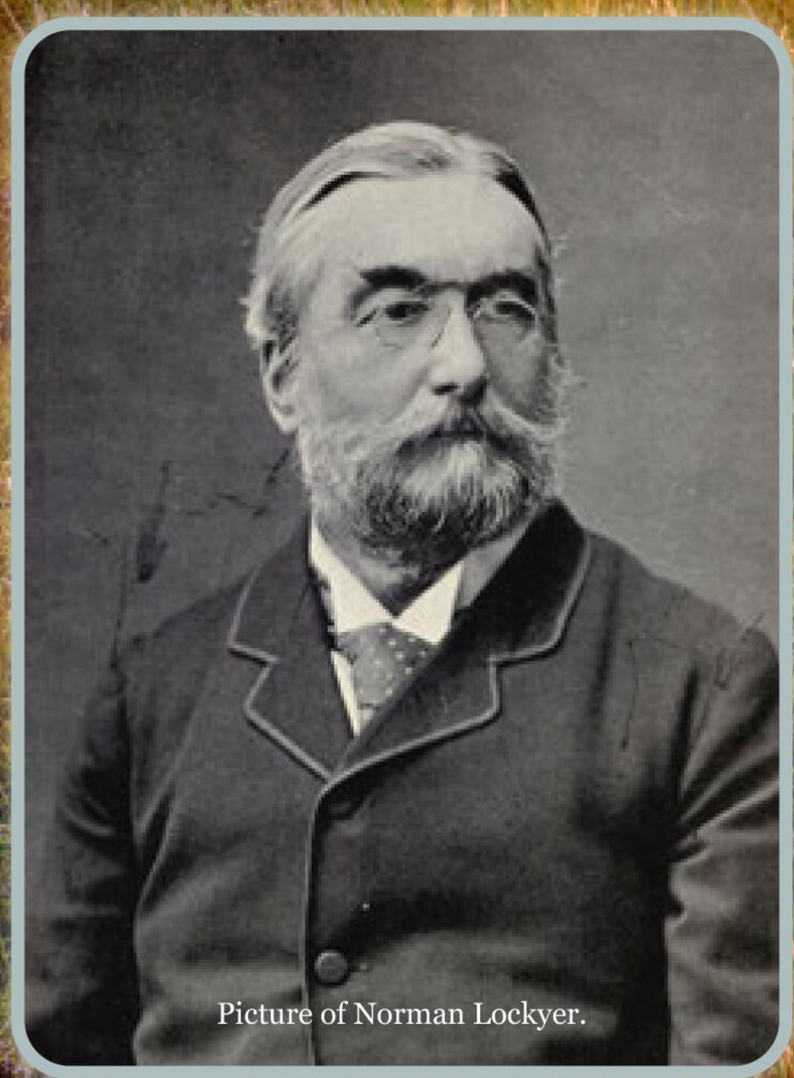
Like Callanish I, they are on a ridge - high ground. The stones of Callanish II, or Cnoc Ceann a'Gharaidb, are five in number, between 2.45 and 3.3 meters in height, and in size is in reality two and a half times greater than Callanish I. Callanish III is called Cnoc Filibhir Bheag, and is not more than ninety meters distant on the other side of the loch. An ellipse 21.6 by 18.9 meters, and thus, again, larger than Callanish I. Its highest rock is 3.3 meters in height.

Bits of charcoal were discovered in holes when cleared of peat, seashore pebbles, and which could have contained wooden uprights in the first place. Another circle, called Callanish IV or Ceann Hulavig, is two miles farther south. It is the narrowest circle, and the five stones are in an ellipse 13.3 by 9.5 meters, the tallest of which measures 2.6 meters. It reveals that Callanish is not a solitary case, but it is special, perhaps just due to its four stone avenues.

The Pleiades Enigma

All avenues have huge astronomical alignments, even though some critics do not want to accept the conclusion. Likewise certain of the stones of the inner circle, and those which mark the end of the northern avenue, appear to have sharp tops, indicating that some sort of accurate orientation between the center and a point on the landscape, or on the horizon or even on the sky, was to be marked.

Similar to Stonehenge, people have attempted to crack the astronomical clock in Callanish. The origins of the adventure were provided by Sir Norman Lockyer, who contended that the northern avenue was so oriented as to be pointing at Capella, but this could not have happened until ca. 1800-1790 BC, a full half millennium before Callanish was produced. Aubrey Burl has



Picture of Norman Lockyer.

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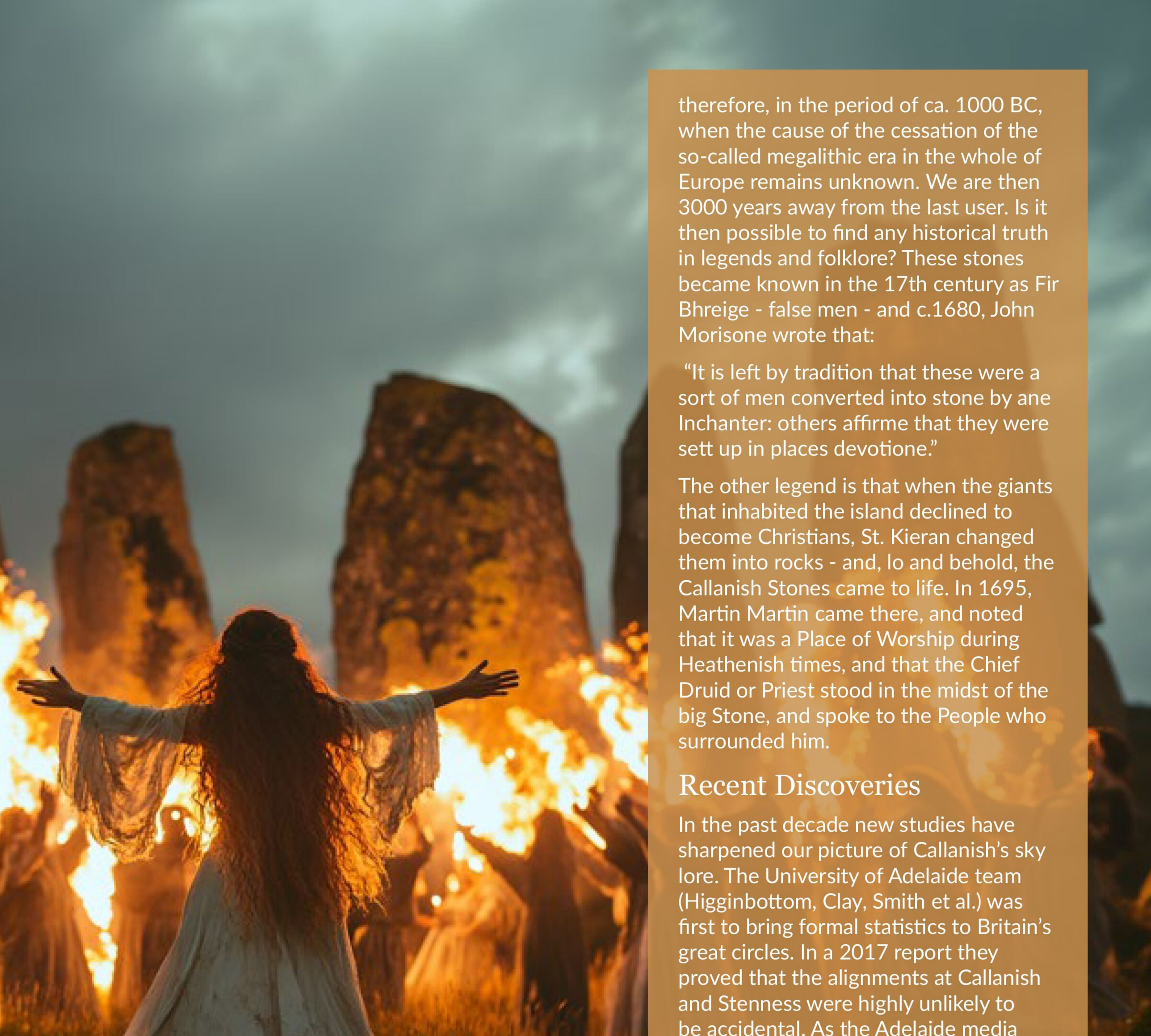
suggested more recently that the eastern row was orientated upon the rising of the Pleiades; he has himself pointed out that this would only fit around 1550 BC, which was very late in the life of the site. Professor Alexander Thom proposed that the fits of the northern avenue (when facing south) indicated the setting of the midsummer full moon behind Mt. Clisham, a hill which forms the boundary of the horizon. One more is at Callanish, a little further east, where another site, a single standing stone, Callanish XIV, makes a fair indicator of the equinoctial sunrise. But Callanish is principally associated with the extreme southern setting position of the major standstill moon. The three stone circles close to Callanish are in fact also oriented to this event and other monuments on the island indicate the same orientation. The explanation why it was incorporated into more than one structure, is that our ancestors desired to be more precise in recognizing the event that took place, meaning it was an important event to the local community. This was an annual eclipse of the moon and every 18.5 years the moon would pass off to the right or left of the waving horizon of Mt. Clisham, or the Sleeping Beauty. She is a character described in the profile of the hills south of Callanish.

The people speak of it as Cailleach na Mointeach, the Old Woman of the Moors. But the Cailleach was also the creator god and is often believed to have wed the sun deity. A connection with the moon would have then fitted very beautifully into the astronomical mythology. The moon comes up where her breasts rise - twin hills; the moon coming through the Callanish stones two or five hours after. When this occurs, when one is at the hillock on the higher south end of the site - the natural outcrop - the moon is being born again with a person in the shadow. It implies that the hillock was certainly an element of the complex, although it now lies beyond the boundary wall of the site.

Besides the Sleeping Beauty, the profile of the hills has also supplied her with a pillow, a conical hill, Roineval, 281 meters high. Conical hills were highly significant to our ancestors - some such as Silbury Hill were artificial extensions to a sacred megalithic landscape. Jacob slept on his pillow which in the Bible was connected to Bethel, and connected to the British coronation stone, the Stone of Scone. The fact that this sacred landscape includes the hill may imply that the hill was worshiped by the people who constructed Callanish and also may have been regarded as a hill of creation, a place of emergence - perhaps even the dwelling-place of the Cailleach herself.

Callanish was obviously a part of some complicated system, thoroughly designed and developed by our forefathers. Of ancestors, however, we know very little. In 1857, however, the late Sir James Matheson, the proprietor of Lewis, instructed his chamberlain, Donald Munro, to have the stones cleared of peat. The moss was found to have an average depth of five feet and this indicated that the circle was covered with peat almost 3000 years before the time of writing. It was, like so many other stone circles in Europe, abandoned,

Perth and Kinross Scone Palace Stone Replica.



therefore, in the period of ca. 1000 BC, when the cause of the cessation of the so-called megalithic era in the whole of Europe remains unknown. We are then 3000 years away from the last user. Is it then possible to find any historical truth in legends and folklore? These stones became known in the 17th century as Fir Bhreige - false men - and c.1680, John Morisone wrote that:

"It is left by tradition that these were a sort of men converted into stone by ane Inchanter: others affirme that they were sett up in places devotione."

The other legend is that when the giants that inhabited the island declined to become Christians, St. Kieran changed them into rocks - and, lo and behold, the Callanish Stones came to life. In 1695, Martin Martin came there, and noted that it was a Place of Worship during Heathenish times, and that the Chief Druid or Priest stood in the midst of the big Stone, and spoke to the People who surrounded him.

Recent Discoveries

In the past decade new studies have sharpened our picture of Callanish's sky lore. The University of Adelaide team (Higginbottom, Clay, Smith et al.) was first to bring formal statistics to Britain's great circles. In a 2017 report they proved that the alignments at Callanish and Stenness were highly unlikely to be accidental. As the Adelaide media release explains, they found "a great concentration of alignments towards the Sun and Moon at different times of their cycles". They also highlighted the landscape factor: depending on local topography, some sites frame the summer solstice sun in the north while others frame the winter solstice sun in the south. All told, the researchers concluded that "ancient Britons connected the Earth to the sky with their earliest standing stones, and that this practice continued in the same way for

2000 years". In other words, Callanish is not a quirk; it anchors a long tradition of Scottish stone-circle cosmology.

More recently, archaeoastronomers have looked beyond the Sun and Moon. A 2021 study by David Nance (University of Aberdeen) argues that the eastern stone row of Callanish was aligned with Venus and the Pleiades on summer-mornings. Using radiocarbon dates for the row's construction, Nance calculates that around 1677–1674 BC the rising Pleiades cluster would have emerged exactly along the row's azimuth – the same time Venus made a so-called heliacal "crossover" at dawn. He intriguingly suggests Neolithic Gaelic myth (Gwener = Venus) hints at a "divine wedding" of Sun and Venus at summer solstice, echoed in this alignment. While this is a novel interpretation, the claim is grounded in data: "The azimuth of the rising Pleiades coincided with the Venus crossover of 1677 and 1674 BC," Nance reports. If validated by further study, it would make Callanish the first European circle demonstrably oriented to Venus.

Fieldwork has also added context. Geophysical surveys by the Calanais Trust and universities (St. Andrews, Bradford, etc.) have located "satellite" circles around the main monument. At one such site (Airigh na Beinne Bige) evidence of a prehistoric lightning strike was found, suggesting the ancients may have seen divine significance in natural phenomena. At another (Na Dromannan) 3D scanning has let researchers digitally resurrect a buried ring. As Dr. Alison Sheridan notes, this "helps us investigate whether this circle was astronomically aligned".

In sum, new projects combine archaeology and archaeoastronomy: as Dr. Richard Bates (St. Andrews) puts it, Callanish is "remote" and largely unexplored, but modern science is finally probing its secrets. Today, with each new analysis, we better understand how the stones relate to lunar and solar cycles.

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Cultural Significance

For the people who built Callanish, the sky was part of life. The precision of the alignments implies that the moon's standstill and sun's solstice were not mere curiosities, but woven into rituals and calendars. As archaeologist Gail Higginbottom observes, erecting the stones "tells us about [the builders'] strong connection with their environment, and how important it must have been to them, for their culture and for their culture's survival". In other words, these alignments likely helped mark seasons for planting and ceremony, linking earthly and cosmic order. The very effort – moving multi-ton stones to exactly the right bearing – suggests a deeply shared worldview: one scholar remarks that Callanish's new report provides material "from which others can advocate different interpretations" of its builders' beliefs.

Archaeoastronomy is careful to avoid mystical claims, but it recognizes that monuments like Callanish conveyed meaning. The circle's endurance – used and remodeled for centuries – hints at its role as a sacred gathering place. Local legend (as Nance explores) ties celestial events to mythic figures; by illuminating such stories with hard data, researchers hope to "get inside the minds of the people who built the stone circles".

Today Callanish remains a powerful site of heritage: an iconic symbol on the Hebridean landscape visited by scholars and tourists alike (nearly 40,000 visitors per year). As one commentator notes, it has a "special place in the history of archaeoastronomy". But beyond modern fascination, Callanish was above all a community project: one deliberately sited to frame the sky's drama. In the end, it stands not only as an archaeological wonder, but as testament to the enduring human impulse to chart the heavens and tie them to life on Earth.

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THE GAVRINIS CAIRN:
Stone Art and Celestial Alignments

Aerial view of the Gavrinis passage tomb in Brittany, France. The grass-covered mound (c. 60 m diameter) encloses a 13–14 m stone corridor leading to an inner chamber. In all, 29 orthostat slabs form the passage walls – 23 of them bearing elaborate Neolithic carvings. The tomb was built in the late 5th to early 4th millennium BC (c. 4250–4000 BC), contemporaneous with the great Carnac monuments, and is among Europe's oldest surviving structures. Archaeologists found virtually no human remains or grave goods, suggesting an elite or ritual function; soil acidity has dissolved any bone. Excavations in the 1980s showed that the massive capstone once was a giant standing menhir from Locmariaquer, confirming that builders reused familiar monuments. Today Gavrinis is famed for its rich megalithic art – spirals, concentric circles, axes, chevrons and horn shapes – which cover most interior stones.

A Tomb of Engravings

Stepping into the dark passage, one enters a "stone gallery" whose walls are canvases of carved symbols. Laser-scanning surveys have now documented every groove and chip: a 2014 study reports how combined 3D lasergrammetry and high-resolution photography captured the full detail of the decorations. These modern recordings reveal the art's precision and superimposed layers, and even highlight previously faint motifs (using techniques like DStretch color enhancement). In total, 23 of the 29 uprights are ornamented with deeply incised designs. A team led by Serge Cassen is currently analyzing these symbols to understand their manufacture and meaning over the Neolithic period. (A White quartz slab – Stone 7 in the sequence – is deliberately left uncarved, as if to catch any light from above.) In sum, Gavrinis's artistry rivals the famous carvings of Ireland's Newgrange and betrays a sophisticated visual program that archaeologists only now are unraveling.

Solar and Lunar Bearings

Astronomers have long noted that the Gavrinis corridor is roughly southeast-facing. Precise compass surveys show the main

axis bearing about 128°–134° (south-east). In fact, on the winter solstice (around December 21) the rising sun's rays enter the narrow passage. Observations confirm that at dawn on midwinter the sunlight penetrates the low entrance and strikes partway down the corridor – reaching the far chamber wall. In practical terms, the tomb functions as a solar aligner: its builders pointed the passage at the horizon where the sun rises on the shortest day of the year. Unlike Newgrange, where the light fully floods the chamber floor, at Gavrinis the beam appears to hit a height level in the passage – perhaps illuminating that special quartz slab.

Some authors have also noted that the 134° axis roughly aligns with the southernmost moonrise at the Moon's major standstill, creating a second possible celestial event. In other words, the far end of the passage lies near the extreme winter rising point of the sun and the low-horizon rise of the moon's 18.6-year cycle. Where these two lines meet is at Stone 7 (the pale quartz pillar): archaeological measurements suggest this white slab could have caught light from either sun or moon when they rose furthest south. (However, lunar alignments are harder to pin down and remain debated; the sun's

winter beam is the clearest “time-mark” in the tomb’s design.)

The last few decades have marked a research revival at Gavrinis. Along with conventional excavation, archaeologists have introduced a new technology to this prehistoric ground. In 2013-2014 a French project directed by Laurent Lescop and others applied 3D laser scanning and photogrammetry to trace every inch of the passage and chamber. The laser scans provide nice shape and spatial context, and the angled photography light brings out subtle relief. Together, these techniques create data-rich computer models and flawless sketches. This tedious record-keeping will leave the art to be studied (and to govern subsequent preservation).

Meanwhile, even more general archaeological work has narrowed down our perception of the age and context of Gavrinis. Stratigraphy and the radiocarbon dating of this tomb are certain that the tomb was constructed between the years 4200-4000 BC. Approaches to the cairn have been surveyed in detail and older carvings on previously reused stones have been discovered hidden under the remaining

capstones of the cairn structure megaliths.

The fact that Gavrinis is unique has been pointed out in a pending UNESCO application (of the Carnac region): it is “one of the prehistoric riches of the Gulf of Morbihan, and there is none at all like this anywhere in the world”. To make a point, Gavrinis is now an established monument of its own size and is well documented. Its coincidence with the winter sun in the solstice is scientifically tested and hundreds of engraved motifs are catalogued. Continuing scholarship - see e.g. the iconographic studies by Serge Cassen and new excavations - still regards Gavrinis as a central Neolithic site. Again, through careful archaeoastronomy and archaeology, scientists are uncovering how this 6,000-year-old tomb served as a tomb as well as a monumental cosmic calendar. ■

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Under the Cuckoo

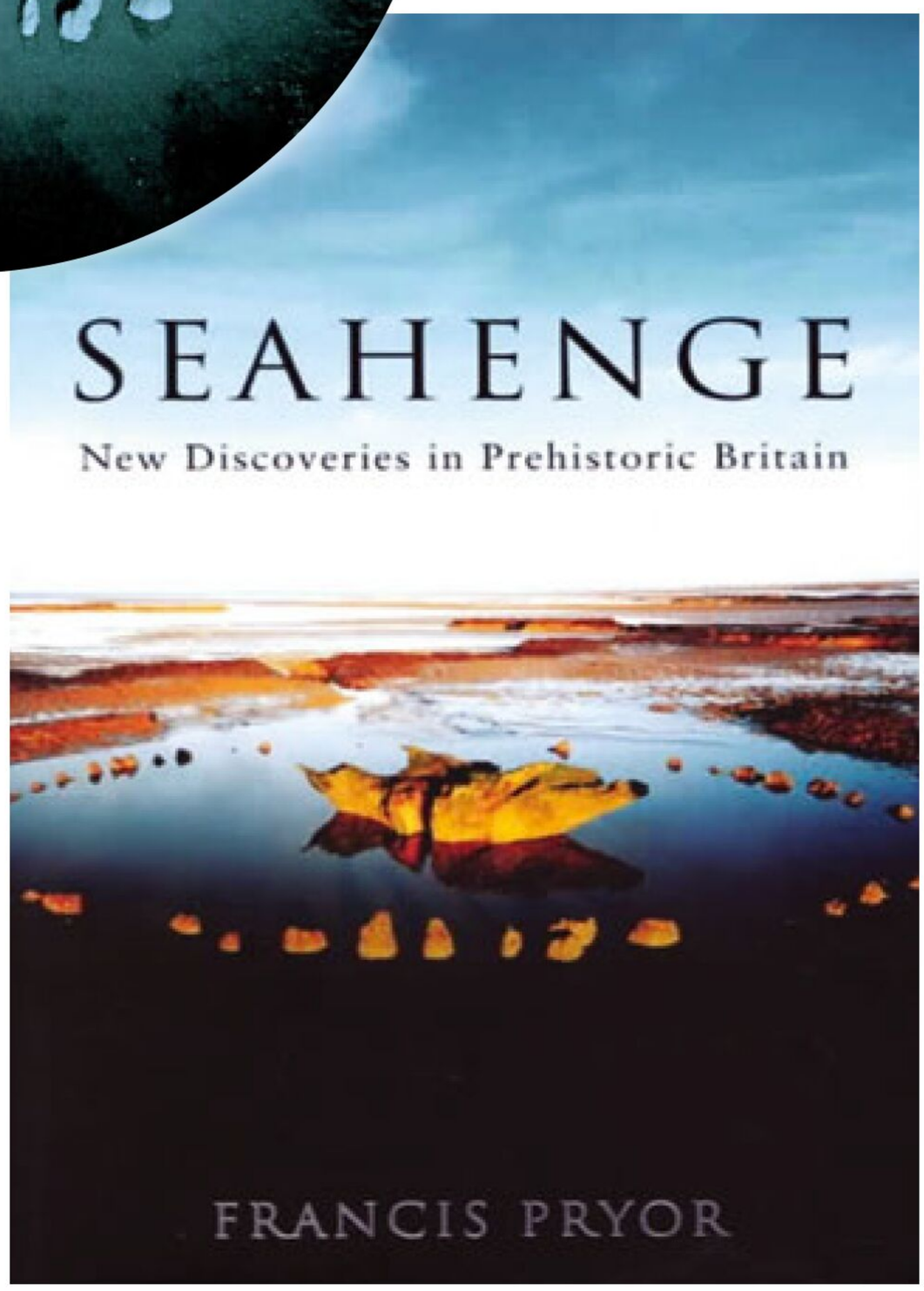
Did a 4,000-year-old Timber Circle on Coast Represent a Bronze Age Prayer

Watch

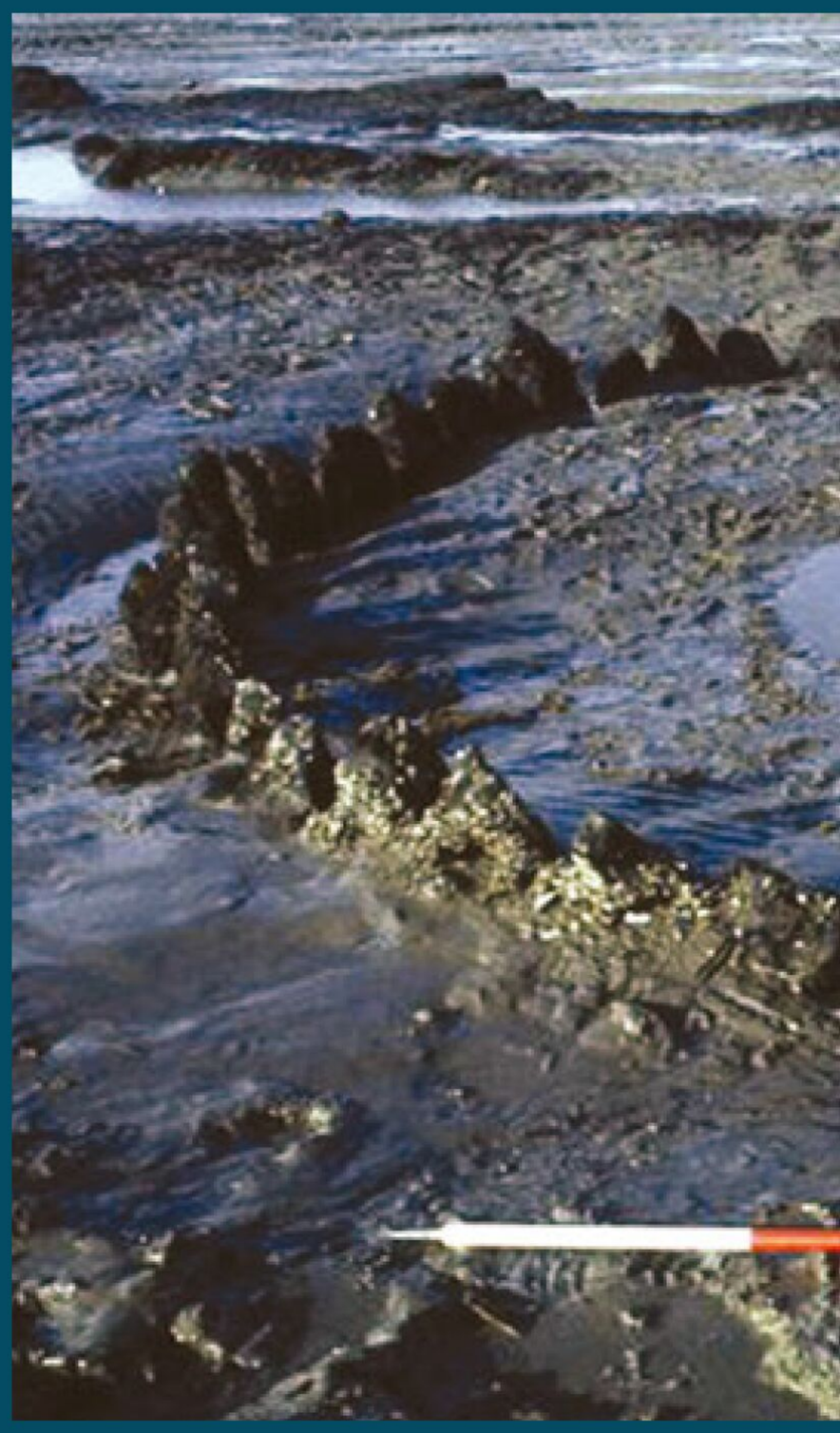
BY MASSIMO BONASORTE

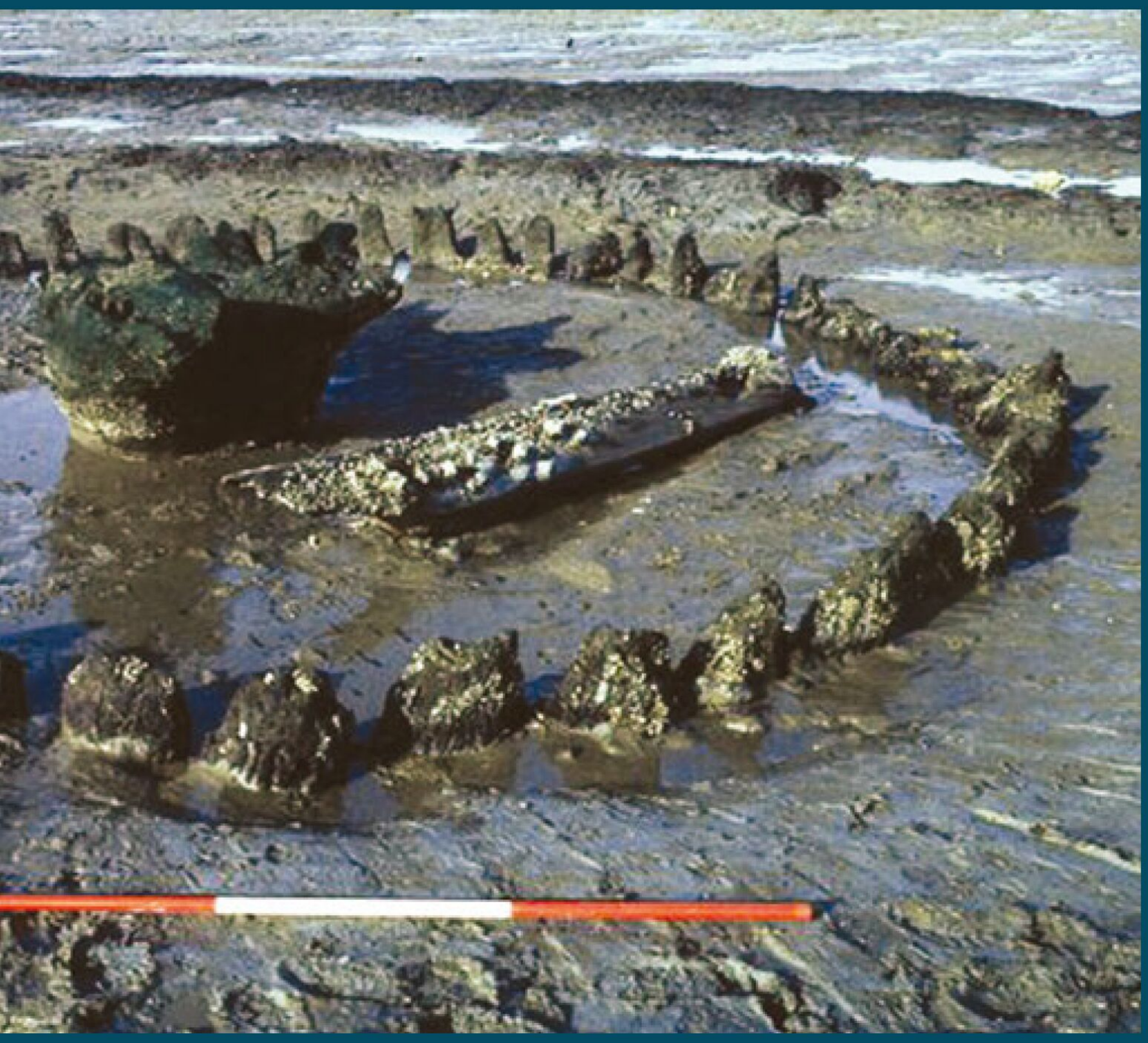
the Norfolk to the Sky?

The raging sea lashed the North Sea coast and the winds whistled, howling their song of destruction. It was 1998, and suddenly a mysterious circular structure appeared out of the sea, with an oak trunk stuck upside down in the sand at its center. Who had created such a work and for what reason? John Lorimer, an amateur archaeologist, was on the beach at Holme-next-the-Sea on the coast near Hunstanton in Norfolk, England. Lorimer was with his brother-in-law Gary, who was fishing for shrimps, when he came across a Bronze Age axe head. The two immediately contacted the Castle Museum in Norwich. Archaeologists examined the axe head and noted that it was the second such find to be discovered on Holme Beach in recent months. Over time, gradual erosion



revealed a kind of stump on the beach surrounded by a ring of wooden posts. Lorimer realized that it was definitely an artificial construction, so he contacted the Castle Museum once again, thus beginning the new story of the “Stonehenge of the sea”, or Seahenge in Norfolk. A group of battered oak posts pokes out of the sand at low tide on a windswept expanse of beach at Holme-next-the-Sea, Norfolk. It is in itself, to the lay ear, an odd artifact - part buried, part above the surface, part lost. Yet to archaeologists, this is Seahenge: a 4,000-year-old timber monument, whose silent rings contain hints about a people between earth and heaven, between starvation and religion. Seahenge - to be more exact, Holme I - was uncovered in 1998 when the sands moved, causing an ideal oval of 55 split-oak posts to be revealed, each plowed in with the bark side facing outwards. In its middle: an inverted stump of oak, roots spread out like frozen lightning. The wood was cut down in the spring of 2049 BC, a date that is determined exactly through the methods of dendrochronologists at Sheffield University and English Heritage (Tyers 2014). There is a second larger circle, 100 meters east, called Holme II, which was cut in the same year. They appear to be the only known Bronze Age monuments in Britain to have been constructed concurrently, their construction date coinciding with one of the most sudden climate shifts of the Holocene. Northwestern Europe did not fare well in the 22nd century BC. The Irish bog oak and Anatolian juniper chronologies of tree





rings capture a sharp drop in climate between 2200 and 2000 BC - the so-called 4.2-kiloyear BP aridification event (Baillie and McAneney 2015; Kuniholm 1993). The same story can be told at Holme by the oak growth rings: suppressed growth, late frosts, and lingering winters when the cuckoo was heard long after dark. The constructors of Seahenge pushed their posts into this cold earth. But why here, why then, and why upside-down?

The Cuckoo and the Goddess

The solution is not in the soil, but possibly in the sky according to a new interdisciplinary study by Dr. David Nance of the University of Aberdeen. A 2024 article in GeoJournal has Nance suggesting that what are now known as Holme I and II were not mortuaries or funerary monuments, but ritual tools to interfere with the weather itself, by manipulating myth, astronomy and the symbolism of the cuckoo. The cuckoo is not just any bird in Indo-European folklore. It comes with summer; it comes without sound, with the cessation of plenty. In Somerset, a folktale of the 19th century describes how the “wise men” used to attempt to write a cuckoo into a thorn bush to prevent the summer being over.

But at Holme, Nance says, the constructors might have tried to affect a more ornate form of the same rite. The oval enclosure of Holme I with its slit entrance and stump in the middle resembles the “fairy bowers” and hollow trees in which the cuckoo was thought to hide during the winter. The posts facing outward, which are the main portion of the bark, constitute a symbolic wall, a Bronze Age cuckoo pen that was designed not only to capture the bird, but also to capture the season. The object: to retain the cuckoo singing, and the summer alive, in defiance of the cooling climate.

Alignments in Wood and Stars

The sky was not an onlooker, however. The first posts of Holme I, posts 35 and 65, are oriented to the azimuth of the summer solstice sunrise, about 46.1degrees on the flat horizon or a little more when viewed over the dunes that formerly sheltered the site (Brennand & Taylor 2003). That morning in 2048 BC Venus appeared at 89.1degrees, and was visible even after sunrise, one of the rare ritual windows when the planet of love and fertility was in the sky with the Sun. By contrast, Holme II looks southeast. Its central bier, two horizontal timbers rebated to fit a coffin or stretcher, is oriented at 114 deg, the sunrise azimuth on the cross-quarter day of Samhain (1 November), when the harvest was over and the winter commenced. In 2048 BC, on the morning of the day of Samhain, Venus was visible in the sky for a celestial conjunction at Holme-next-the-Sea, which happens once every eight years (Nance 2024). To Nance, this is no accident. It is also at Samhain that, as far as Irish mythology is concerned, the sacrifice of sacred kings appeased a goddess of fertility and sovereignty - and sometimes of Venus and the cuckoo. The bier, he says, might have contained the

body of a warrior-champion, a kind of scapegoat king whose death was supposed to restore the balance of cosmos and to bring back the Sun. The constructors were not hermit sages. They belonged to the Bell Beaker culture, the migrants of which had entered Britain in 2500 BC and brought with them bronze, horses, and a Proto-Celtic language (Olalde et al. 2018). Genetic discoveries indicate that by 2000 BC their descendants had conquered the British Isles, the rituals and beliefs being inscribed in timber and stone. They intersected their worldview at Holme: the cuckoo as harbinger, Venus as goddess, the solstice as marriage, Samhain as death. The monuments are not distinct, but they are a triad of monuments in one - one to call in the summer, one to inter the dead king. They make a kind of ritual machine together, tuned by the heavenly mechanics and driven by desperation.

We do not know whether the rite was successful. The cuckoo still leaves in June; the winters still come. But the timbers are there, Half rotten and distorted, Bare of their bark, or mummified, And the years of frost and famine, they eke their rings chronicle. Holme I had been dug and preserved; Holme II had been abandoned to the water, and its posts had been gradually falling, one by one, into the sea. It is not the monument that survives, but the moment: a dawn in 2048 BC when a group of people stood on a salt marsh and watched the Sun rise behind the dunes, Venus shining above the horizon, the cuckoo calling out of the reeds. They thrust their posts in the ground not as a boundary, but as a petition - to the bird, to the goddess, to the sky. ■

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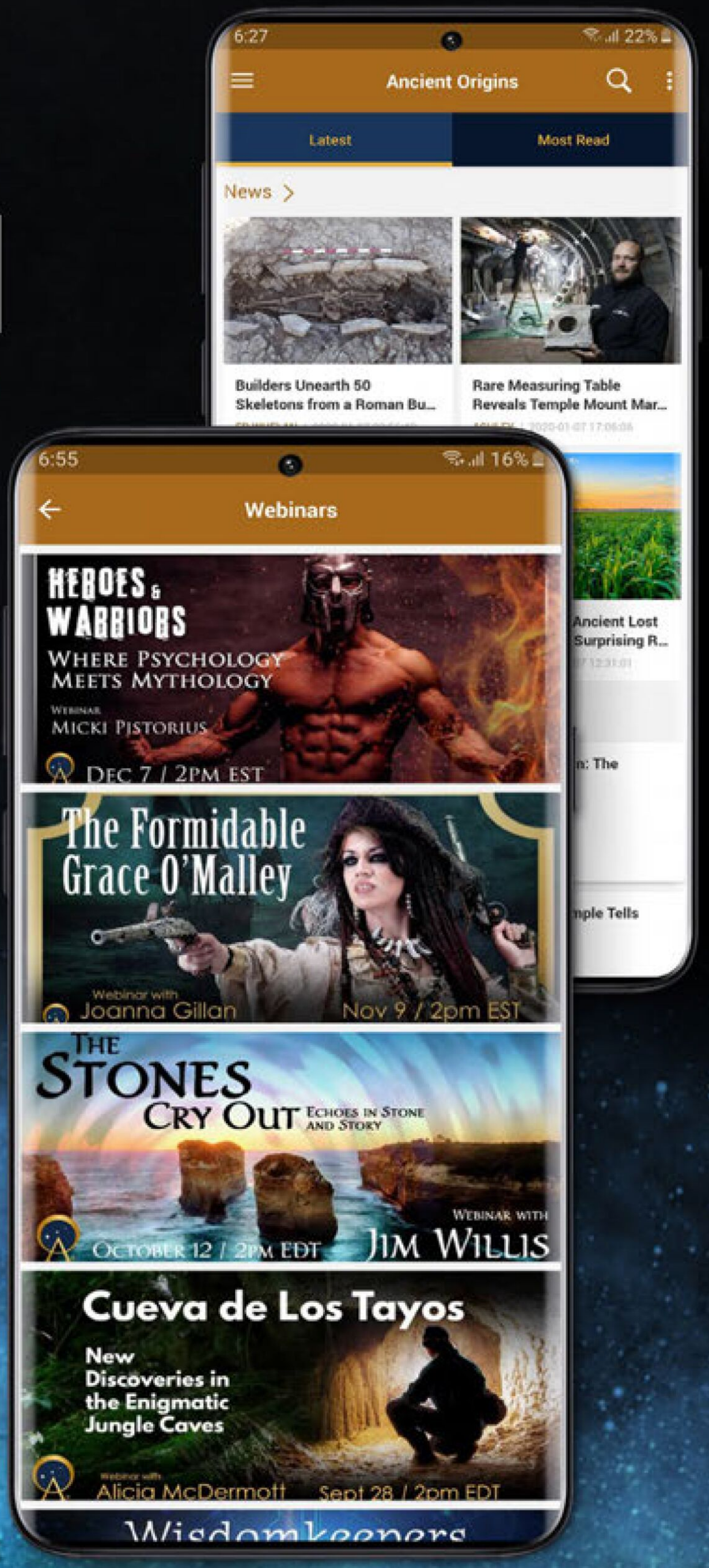

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BY BRYAN HILL AND MASSIMO BONASORTE

How the Goseck Circle Forged

a Neolithic Elite

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An important archaeological discovery in Germany, described as a “milestone in research”, reveals the oldest prehistoric site connected to astronomy, a place where people, who are still referred to today as “primitive”, observed the movements of the sun, the lunar cycles and the motion of the constellations. This took place around 7,000 years ago in Goseck, a full 2,000 years before the iconic stone circle at Stonehenge was built in England.
In 1991, inspectors from the German government took aerial photographs of a small German town called Goseck and saw something strange. On the ground, there appeared to be a giant circular ridge hidden beneath a field. It would take archaeologists 12 years to realize that this ridge was the remains of an ancient solar observatory. Archaeologists also found the remnants of ritual fires and human bones with cut marks on them indicating that the circle was not just for star gazing but also for human sacrifice. Curiously, a 3,600-year-old bronze disc was discovered just 25 kilometers away from the site and is considered to be the oldest physical representation of the cosmos.

Neolithic in Silesia, Lengyel culture pottery, Southern group of Funnelbeaker pottery.

It shares a striking similarity with Goseck Circle. The archaeologist who coordinated the research team at the University of Halle-Wittemberg is firmly convinced that the Goseck site represents not only an astronomical observation point but also one of the oldest and most important sacred sites in Central Europe. Goseck therefore paints a new picture of Neolithic man, if ever one was needed, focused on understanding his habitat but also looking to the sky, perhaps in search of answers to the great mysteries of his existence. As with many other discoveries, it was chance that led to the find, which is unique in European history and archaeology. A small tourist plane flying over the area reported seeing a sort of circular 'incision' in the ground near the town of Goseck, with what appeared to be three access entrances. The first excavations began in 2002 and the importance of the site was immediately apparent when its function became clear: it was an observatory for the stars. The prehistoric site, compared to the approximately two hundred similar sites scattered throughout Europe, has one peculiarity: there are only three access routes, whereas normally there are four. However, the Goseck 'circle' has more than just this anomaly. It consists of a series of concentric rings made

Female figurine, clay, Neolithic Vochov, 4900–4500 BC.

Manuel Schmid Foto/AdobeStock

Iurii/AdobeStock

of wooden poles, each as tall as a man, and the entrances and rings themselves gradually narrow towards the center, in a sort of funnel-shaped path, perhaps indicating that only a few men had access to the central circle – the sacred place. According to Wolfhard Schlosser, one of the leading experts in archaeoastronomy, this particular configuration is the first example of a prehistoric astronomical observatory.

The Enigma of the Builders

The circle has a diameter of seventy-five meters and was originally composed of four concentric circles, a mound, a ditch and two wooden palisades with three access gates located in the south-east, south-west and north respectively. According to Schlosser, the southern entrance points to the rising and setting of the sun at the summer and winter solstices, enabling the early Europeans to accurately determine the sun's path across the sky. Schlosser is convinced that the site was built for the observation of astronomical phenomena such as the movement of the sun, moon and stars, and to track the passage of time. These celestial cycles would have been important for the sowing and harvesting of the early civilizations.

Sina Ettmer/AdobeStock

To date the site, the team of German archaeologists based their findings on the style of some pottery fragments found inside the circle, dating back to around 4900 BC. The people who built Goseck Circle are known only as the Stroke-Ornamented Ware Culture, from the fragments of pottery they left behind. Various pottery shards belonging to this culture were dug out from the site and date back to around 4700 BC. The discovery of the shards also suggests that the site was functional for a period of 200 years and then abandoned. They represent a transition from Neolithic linear pottery to Stroke-Ornamented Ware Culture. The jars and bowls had their decorations impressed into the soft clay with a kind of fork to form zig-zag lines. Archaeologists know nothing about the appearance or language of the people who built Goseck and can only surmise what their religious beliefs might have been.

Some claim the circle was a calendar that told ancient farmers in the area when it was time to begin counting the days until spring planting. However, excavations of the 6,000 square-meter site have also found the remains of headless skeletons, human and animal bones, decapitated oxen and ritual fires, all pointing towards burial rituals or human sacrifice.

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Excavations carried out near the circle have uncovered the remains of wooden and clay dwellings with remnants of grain and evidence of animal domestication. They were probably a sedentary people engaged in agriculture and livestock farming who, about 500 years earlier, occupied the site where the Goseck observatory was later built.

This is, we repeat, a great discovery: a Neolithic people measured the movements of the sun for millennia, quantifying the lunar cycles and the position of the constellations with extreme precision. But Goseck is not simply a 'calendar construction', explained Schlosser, 'it is clearly a sacred building'. Archaeologists have found numerous pieces of evidence that Goseck was a place of prehistoric worship. The arrangement of human bones, for example, is typical of burial sites, and marks on them suggest that human sacrifices were performed there. Bertemes said it is not surprising that astronomical observatories functioned as places of worship and centers of social and religious life and that, at the same time, they were of vital importance in a society dominated by seasonal changes.

The original configuration and traces of Goseck Circle reveal that the structure once consisted of two wooden fences, one mound and four concentric circles. The site was approximately 75 meters (246 feet) in diameter. A narrow ditch enveloped the circular wooden wall and three gates – one facing north, one facing southwest and the last one facing southeast – were equally spaced around the outer edge. Standing at the center of the structure during the winter solstice on 21 December, a person could see the sun rise from the southeast gate and set through the southwest gate. It has been observed that the

entrances get progressively smaller the closer to the center one gets, which would have concentrated the sun's rays into a narrow path. The third gate at the site remains something of a mystery and points north, but not quite. It may have nothing to do with astronomy, for the compound was more than just a solar station.

Goseck Henge is considered to be the oldest official solar observatory in the world. It lies on the same latitude as Stonehenge. Stonehenge and Goseck both lie on the exact latitude at which the midsummer sunrise and sunsets are at 90° of the moon's northerly setting and southerly rising.

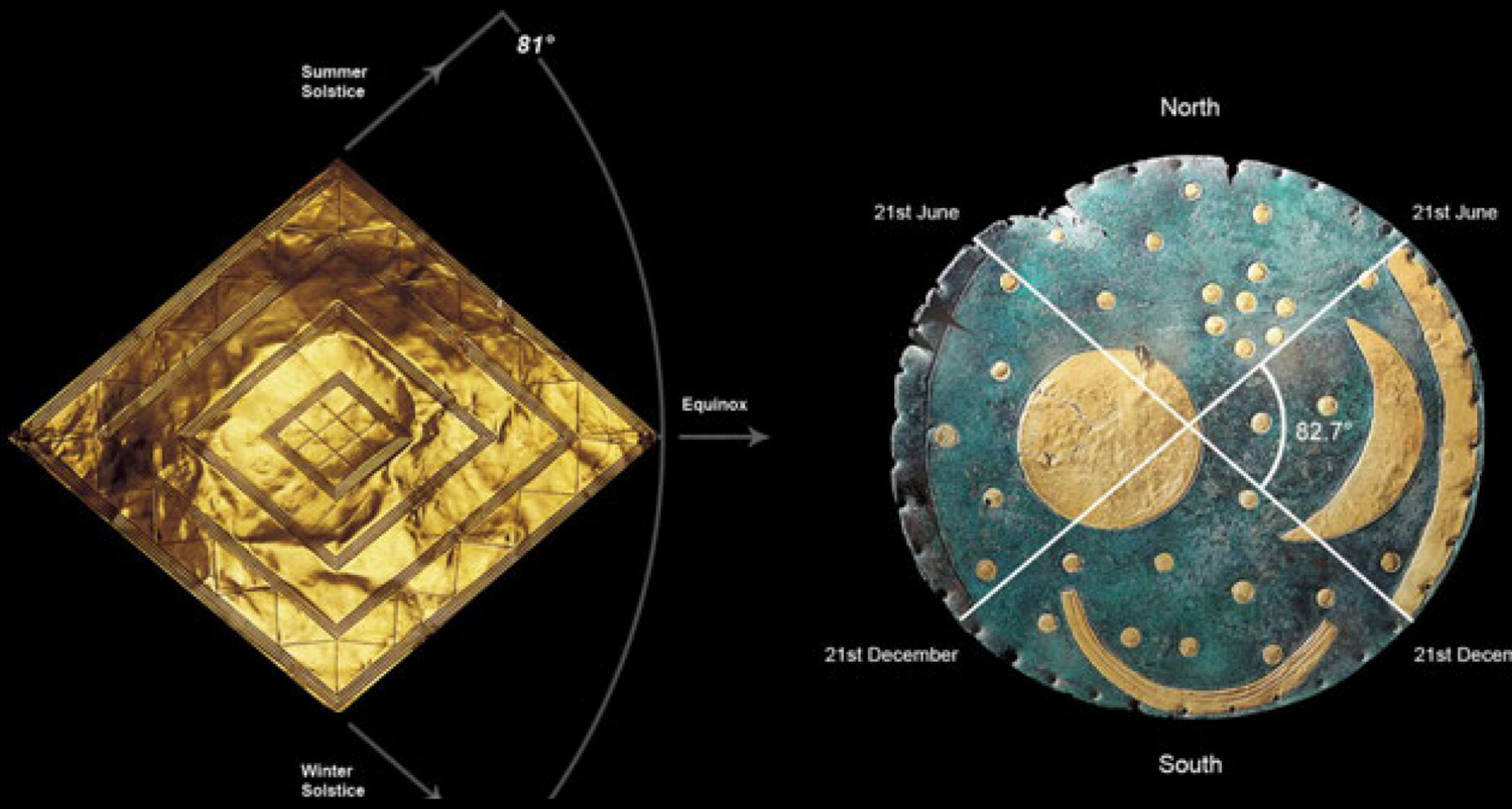
This particular phenomenon is only possible within a band of less than one degree, of which Stonehenge and Goseck lie in the middle third. The site also sits on one of two unique latitudes in the world where the full moon passes directly overhead at its maximum zenith.

Connection with the Nebra Sky Disk

One of the most interesting aspects of Goseck Circle is the fact that the roughly 100-degree span between the solstice gates corresponds with an angle on a bronze disk unearthed 25 kilometers away, near the town of Nebra, Germany. There are different opinions regarding a possible connection between the Goseck site and the Nebra disc, but it is certain that the two discoveries focus on an ancient cosmological view of the world of early civilizations. At first glance, the Nebra disc appears to be a ritual object, but ongoing archaeoastronomy studies are revealing a profound knowledge of the sky, highlighting how, in reality, the disc may have been a tool capable of 'recording' the stellar observations of Goseck or other similar sites. ■

THE NEBRA DISK UNVEILED

BY GUIDO COSSARD



The disc was found in 1999 by so-called 'treasure hunters' near the village of Nebra, at Mittelberg, a hill in the Ziegelroda forest, 50 km west of Leipzig, together with a sword and other metal tools. Subsequently, in 2003, the metal disc was traded on the market for stolen archaeological material, and it was thanks to the intervention of the German state archaeologist, Dr Harald Meller, that the Museum of Halle was able to acquire it.

The Nebra Sky Disk was immediately analyzed in the most prominent German laboratory for the analysis of materials dating back to the Bronze Age. Here, Dr Heinrich Wunderlich was able to analyze the state of corrosion of the object, which occurs when the artifact is subjected to the slow but constant effects of atmospheric agents and falling or flowing water. Dr Wunderlich subjected the corrosion on the Nebra Sky Disk to microscopic analysis, finding that the chemical structure of the crystals showed the typical large bubble formation characteristic of non-falsified corrosion. While the analysis ruled out any possibility of forgery, it did not specify a probable historical manufacture date.

For dating purposes, researchers had to rely on some objects found together with the disc - two very unusual swords. The result established a date around 1600 BC, an astonishing conclusion considering the type of culture and civilization that was always thought to have occupied those places at that time.

But how did they come to identify the Nebra Sky Disk as a reconstruction of a star map? Professor Wolfhard Schlosser, one of Germany's most famous archaeoastronomers, explained that his first impression when he was shown the artifact was that it was a map of the sky. The problem was to understand whether it was a fanciful representation or whether the engravings actually represented a precise location in the sky. And in this case, when could the starry sky be seen in this way and, above all, from where?

The German professor immediately identified the seven nearby stars, undoubtedly representing the Pleiades. These stars were well known to ancient peoples in Greece, Mesopotamia and Russia. The Pleiades constellation consists of eleven stars, but in an era when there were no powerful telescopes, only seven were visible to the naked eye, the same ones depicted on the Nebra Sky Disk. Schlosser was rightly struck by this discovery, as the depiction of the Pleiades was known in Egypt and Mesopotamia at that time, but certainly not in central Europe, in Germany.

Mapping the stars, depicting them and identifying them

muratart/AdobeStock

has always been something of an ‘obsession’ in human history, but no one can say who first began to understand their movement or when. How is it possible, then, that the Nebra Sky Disk, dated, we repeat, to around 1600 BC, contains such a clear depiction and arrangement of stars? As Dr Meller rightly stated, the Nebra Sky Disk represents the first real, concrete astronomical representation in human history. Is it possible that in this part of obscure Europe there were people capable of developing a more advanced knowledge of astronomy than the Egyptian civilization?

In addition to the stars, the disc also depicts the Sun and Moon; below, almost on the edge, you can see what appears to be a representation of a boat: the sun boat. To study this figure, Harald Meller contacted Dr Flemming Kaul of the National Museum of Denmark, which houses an incredible collection of ancient images of boats engraved on rocks throughout northern Europe. The images show a curved line, often surrounded by rowers, but no image of a boat that can sail the sea. These are not depictions of boats associated with religious cults, while the one on the Nebra disc seems to ‘accompany’ the Sun’s journey to the hidden world. Kaul, based on his experience, stated that the boat on the disc is a real solar boat. The representation of a boat as a ‘ferry’ for the Sun is one of the strongest images present in many prehistoric

The weapons found with the Nebra Disk.

civilizations and originates not in Europe but in Egypt. The ancient Egyptians believed that the powerful sun god, Ra, travelled across the night sky in a ship, thus enabling him to return and be reborn at the next dawn. How, then, can we find this same idea in the Nebra Sky Disc?

Perfect Angles

Archaeologists are thus faced with two ‘anomalies’: the first is the depiction of the Pleiades, the second is a symbol that strongly recalls Egyptian culture. Is it possible that the Nebra Sky Disc is not European? Perhaps the disc simply arrived in Germany through trade. And if so, it would not be such a great discovery. Not because the object itself is not a valuable find, but rather because it would not greatly affect the established image of a Europe populated by primitive cultures with virtually no knowledge of any scientific notion. Or is there more to it than that?

Once again, Professor Schlosser’s experience in archaeoastronomy comes in handy. By measuring the angle of the semicircle on the edge of the disc, he notes that it corresponds to 82 degrees, a very precise, specific measurement. This measurement reminded Schlosser of the knowledge of ancient peoples, who built their monuments aligned with the summer and winter solstices, when the sun moves at an angle of 80 degrees across the horizon. But this precise angle varies from place to place: from 90 degrees in the north to 70 degrees in the south. Only in a small strip of central Europe does the angle measure exactly 82 degrees. Professor Schlosser

therefore decided to travel to Nebra, where the artifact was found. There, in Nebra, both solstices measure an exact angle of 82 degrees!

But this could be a coincidence; it does not seem to be scientific proof of the disc's origin. More information is needed. And that is what Dr Meller did, seeking the advice of Professor Ernst Pernicka of the University of Tübingen, who is a specialist in ancient metals. Pernicka had to establish, with scientific accuracy, the origin of the metal of which the Nebra disc is composed, and to do so he needed to compare the disc with metal from ancient mines in the Austrian Alps.

The Nebra Sky Disc is made of bronze but also contains copper; the latter has the peculiarity of having isotopes which, when analyzed with a mass spectrometer, allow the place of origin to be determined through their radioactivity index. By comparing a sample taken from the Nebra Sky Disc with copper from mines in the Mediterranean, it was thus possible to scientifically prove that its origin is undoubtedly from the heart of Europe: Germany.

This is the evidence we were waiting for, the scientific result that determines that the European populations of the Bronze Age also possessed sophisticated astronomical skills, just like in Egypt. One final question now arises: what significance could the Nebra disc have had for those people? Were there religious aspects associated with the disc? Let us therefore try to analyze the images on the disc.

Decoding the Nebra Design

The sun was a very important figure in the religion of the Bronze Age Northern Europeans; the connection between the Sun and life is clear. If the Sun disappears, life also dies. The second figure is the crescent moon. In Germanic cultures, the Moon was a symbol of the passage of time.

Time was something inexplicable in ancient times, and if someone could understand and control it, they had power. Then we have the semicircle that acts as the horizon and establishes the sacred solstices in Central Europe. Below these figures from Northern and Central European culture, we see the figure of the solar boat, first discovered in Egypt. Finally, we have the stars and, importantly, the group of seven sisters: the Pleiades. This constellation was of considerable importance in ancient times as its visibility

in March and October marked two dates of great value for agricultural life. Hesiod confirms this importance in his works:

“When the Pleiades rise, daughters of Atlas, the harvest begins; ploughing at their setting; for forty nights and forty days they remain hidden, then, as the year turns, they appear first when it is time to sharpen the tools.”The Sun, the Moon, the solar boat, the Pleiades and the solstices: five great concepts connected to the religious themes of this people, settled in the heart of Europe. Finding them connected together in a single object, the Nebra Sky Disk, is truly a great discovery.

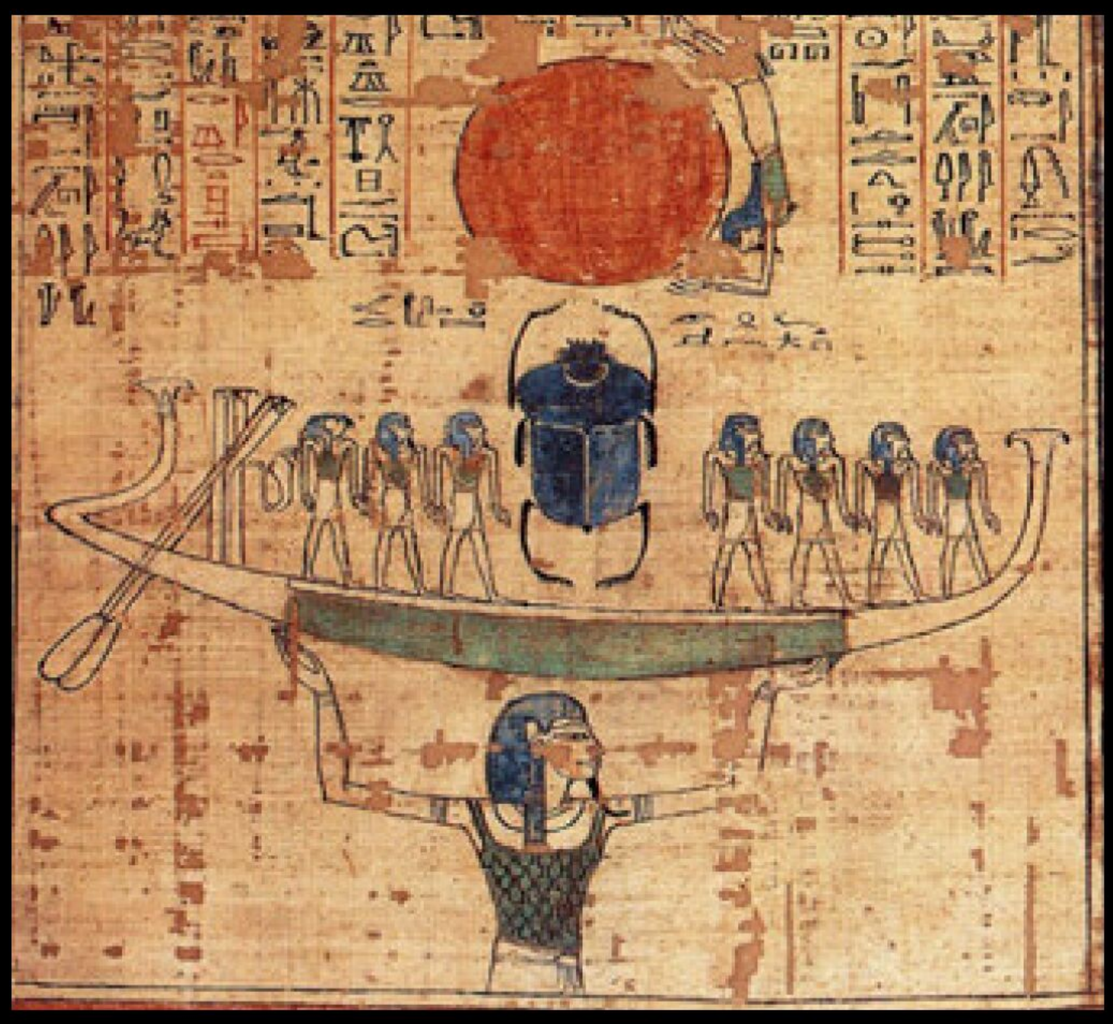
Fathoming the Nebra Sun Disc’s Purpose

The Goseck site dates back to around 5000 BC and, although still under study, can be considered the oldest astronomical observatory. Here, a settled population observed the sky for millennia, following and recording the movements of the stars. The Nebra Sky Disk represents the sum of their beliefs, their observations and their way of seeing the world.

However, it is important to note that the two semicircular bands on the edge subtend an angle of 82.7° each from the center of the disc. This value is not random. The point at which the Sun rises varies throughout the year between two extremes, which are reached on the day of the summer solstice and the day of the winter solstice, respectively. The amplitude of the angle identified by the two extremes, with respect to an origin located at the observer, depends on the latitude from which it is observed. This angle, at the latitude of Mittelberg, where the disc was found, is very close to the value represented on the disc by the two plates. In other words, by placing the disc horizontally and sighting the various points of sunrise on the horizon throughout the year, the plate could indicate the extreme points of sunrise.

The same can be said for the point of sunset, which would explain why the two bands were placed on diametrically opposite sides of the disc. This detail would suggest that the Nebra disc was a real measuring instrument: the two circular bands could have been used to measure the movements of the Sun’s rising and setting points throughout the year.

However, considering that such measurements would not be extremely accurate, some believe that the disc was used as an educational device, through which the



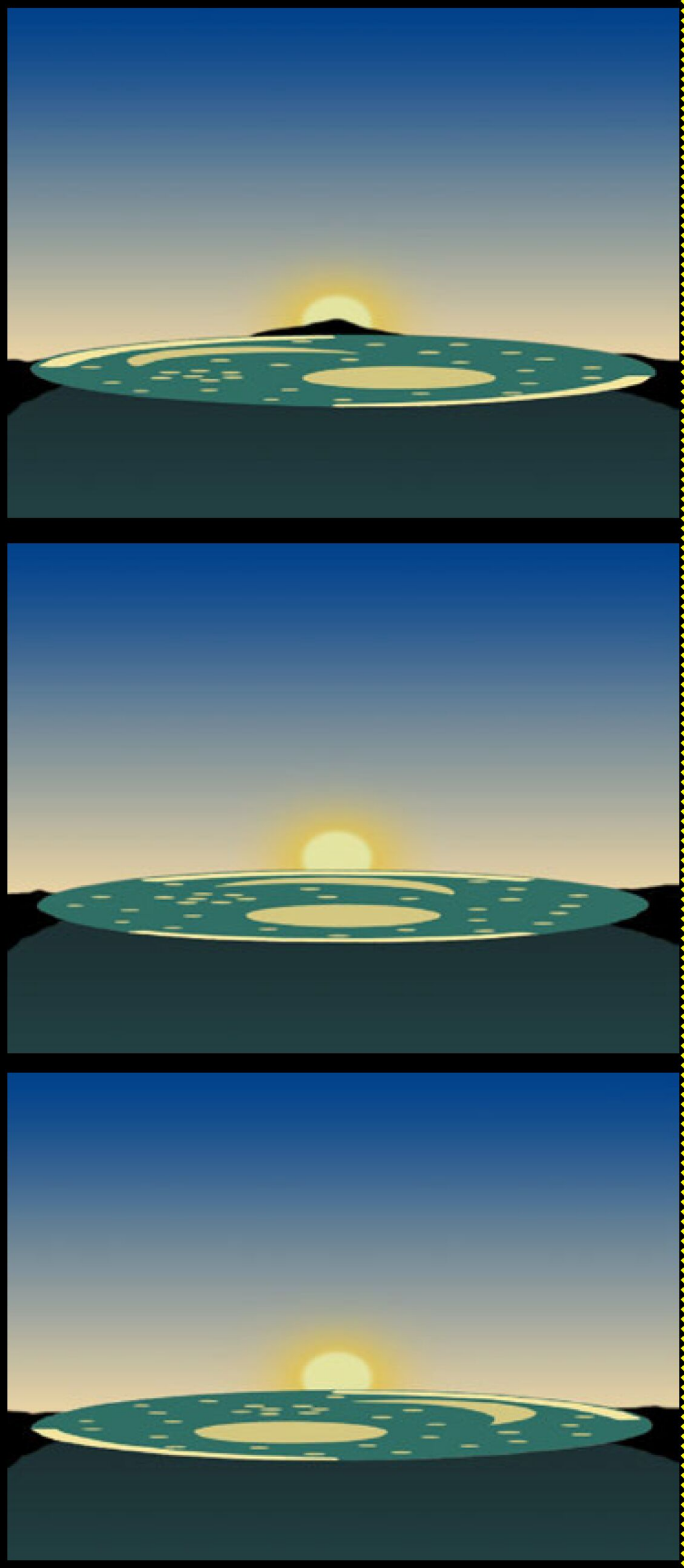
Example of boats from Tanum, Sweden (© Carola Stober).

AdobeStockPeter Jurik

motion of the sunrise and sunset could be followed, even if only from a qualitative point of view. Of course, the symbolic nature of the stars was always connected to aspects of worship: in this respect, the disc could be a sacred object.

Another hypothesis concerns the possibility that the Nebra Sky Disc represents a very specific phenomenon: a solar eclipse. By reconstructing the sky over Germany during the Iron Age on a computer, we can see that an eclipse, which may have been depicted on the disc, could be the one that occurred on 8 May 1617 BC. This phenomenon was clearly visible from Mittelberg: even though it was an annular eclipse, it covered a large percentage of the solar disc (95.6%) and therefore, from the point of view of a prehistoric observer, it was comparable to a total eclipse. The maximum phase of the eclipse occurred at 15:22, and the position of the Sun and Moon at that moment was in the constellation of Taurus; therefore, during that eclipse, the Pleiades suddenly appeared near the darkened Sun.

The idea that the Nebra Sky Disk is a sort of 'snapshot' of the maximum phase of the eclipse of 1617 BC is very intriguing and is further supported by another aspect: by simulating the eclipse, we can see that during the phenomenon, the Sun took on all three shapes represented on the Nebra Sky Disc: the sickle would therefore represent the eclipsed Sun, and not the Moon, and even the 'boat' would find a more plausible explanation in the profile taken on by the solar disc at a particular moment during the eclipse. What do you think?



The **Dolmen** of the Turtle God

STELLAR MAPS AND ANCIENT RITUALS IN KOREA

BY MASSIMO BONASORTE

If we think about the most impressive megalithic burials in the ancient world, the imposing dolmen – the mute custodians of ancestral ceremonies - rapidly come to mind. We know of many types in Europe, but there is a place that retains an unexpected amount of them - Korea. There are about 50,000 Korean dolmen officially censed and in 2000, the Gochang, Hwasun and Ganghwa sites were added, for their archaeological importance, to the UNESCO World Heritage List.

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These three sites contain the highest density of dolmens in Korea, and testify to the presence of a thriving megalithic culture that developed in these lands during the Neolithic and the Bronze Age, between the 2nd and 1st millennium BC.

The prehistoric sites of Gochang, Hwasun and Ganghwa have many examples of dolmen that stand out not only for their excellent state of conservation but above all for some unusual features, unfortunately still underestimated, such as the presence of numerous cups engraved on the upper stone of the dolmen, an unmistakable sign of astronomical observations.

Let's take a look at the historical picture in detail: the Jungnim-ri dolmen group in Gochang dates back to the 7th century BC, and we know that the construction of megalithic tombs ceased around the 3rd century BC. At Hwasun, the slightly newer site, can be traced back to the 6th and 5th century BC, while the dating of the Ganghwa site is very problematic. An interesting study was published by a team of Korean scholars in the book titled *Fifty Wonders of Korea Volume 2*. Science and Technology have analyzed in detail the characteristics and aspects still unknown of the Korean megalithic graves, with particular attention to the so-called "astronomical" signs.

According to the researchers, the astronomical directions discovered could even predate Babylon's astronomical drawings. The Korean Peninsula, underscore the scholars, holds two-thirds of the dolmen around the world with about 50,000 structures surveyed by the academic world.

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In his book *The Seven Wonders of Korea*, Professor Lee Jong-ho tried to explain the origin and significance of the enigmatic signs, stating that "*the cavities present on dolmen depict some constellations and show a concrete evidence that the ancient Koreans possessed a refined science*".

The largest concentration of dolmen with stellar maps is found in the Pyongyang region and number about 200. It is commonly believed that the cups depict the stars, the Sun, and the sky and are associated with particular funeral ceremonies, although some scholars advance the hypothesis that a series of ancestral rituals may be indicated, or the number of animals sacrificed to gods during the rituals. An in-depth examination of the stone cavities, however, revealed that they often represent precise constellations positioned around the polar star. To get an idea of how accurate the depictions are, you can analyze the dolmen of Woesae Mountain in the south of the Pyongyang province. The upper dolmen stone has 80 holes with a central cavity depicting the north pole, while the other cups engraved in the rock indicate 11 constellations.

The extraordinary appearance of the monument also resides in the way used to depict the stars, in fact, the size of the cavities in the stone varies in proportion to the brightness of the star indicated, the brighter the star, the larger the hole. Analyzing this stellar indication, it was possible to establish, taking into account the equinoctial precession, the time when the map representing the night sky of 2800 BC was engraved.

We do not know exactly why the star maps were engraved on the top of the dolmen, but the general idea is that the ancient death-related traditions were related to

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the image of the sky. This could be demonstrated by the fact that many of the top stones of the dolmen with stellar depictions are very similar in shape to the back of a turtle. The ancient Koreans worshiped the animal as one of the ten symbols of longevity and eternal youth. Probably, making the top stone of the dolmen in a turtle shape, the ancient Koreans believed in securing happiness after death and receiving protection from the Turtle god. The studies continue and will surely reveal interesting novelties about astronomical knowledge, not only of ancient Koreans but of the whole ancient world. ■

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Zorats Karer

A MEGALITHIC ENIGMA IN THE ARMENIAN HIGHLANDS

BY MASSIMO BONASORTE

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Zorats Karer is a mysterious prehistoric megalithic site located on a windswept plateau in southern Armenia. The site, also referred to in the vernacular as Karahunj (or Carahunge), meaning ‘stone whispers’, or singing stones is also compared to Stonehenge due to its ring of standing stones and prehistoric atmosphere.

Located in Sisian, Syunik Province, the wind comes in first on the eve of the summer solstice. It goes up the 1,770-meter ridge above the canyon of the Dar River, hops between basalt megaliths and emerges in 84 hand-hewn holes with a low, breathy whistle the locals refer to as hunge-speech. A few moments later, the plateau appears to draw in a breath, as though the rocks themselves are chanting some forgotten liturgy to the dawning stars.

At least 223 standing and fallen stones have been counted at the site by archaeologists, most of them tipped with a circular perforation, interspersed with burial cist and stone cairn which suggests funerary purposes. The largest pinnacles are as heavy as 10 tons and rise to a height of as much as 3 meters, their faces lichen-streaked and weathered. At a distance, the layout of Zorats Karer is impressive: the complex is joined at the center by an oval or circle of approximately 40 stones, and the stone alignments run out as arms to north and south, and to the northeast in particular. The main ring has some collapsed stones in the center that may be a tomb or an altar. The megaliths were long ago referred to in local folklore as the Army of Stones (Turkic Ghoshun Dash), and pictured as soldiers who had been frozen in a prehistoric battle.

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In fact, the site had been recorded to contain Bronze Age burial chambers as early as the 1930s and 1950s, which led to the belief that Zorats Karer served at least in part as an ancient necropolis. However, towards the end of the 20th century a quite different meaning was beginning to emerge, one that was not upward-looking, but downward-looking.

Celestial Alignments in Stone

Only in the 1980s did scientists start to take Zorats Karer as an ancient astronomical observatory seriously. This changed in 1984 when an Armenian archaeologist, Onik Khnkikyan, proposed that the standing stones, especially the ones with the round holes could have served as prehistoric stargazing posts and not as livestock pens.

Erainbow / AdobeStock

These holes are always 4-5 cm in diameter on the narrow side, increasing to 8-12 cm, and are drilled with great care on the tops of approximately a third of the stones. Khnkikyan conjectured that a viewer would see stars or sunrises through the openings, similar to primitive telescopes or surveying poles.

Curiosity over this concept led astrophysicist Elma Parsamian of the Byurakan Astrophysical Observatory to organize some systematic studies at Zorats Karer in 1985. According to the account of Parsamian and colleagues, a number of stone-hole sightlines are in alignment with the location of the Sun during the summer solstice, the point at which the sunrise and the sunset coincide in the longest day of the year. That is to say, on the summer solstice, the first and last rays of the sun pass through specific notches of the standing stones - a definite astronomical orientation.

Vladimirzhoga3/AdobeStock

Other seasonal solar points were also potential contacts in Parsamian surveys, and the site was hypothesized to have been used as a calendrical instrument by ancient sky-watchers.

The concept of an ancient observatory at Karahunj was further boosted in the 1990s, due to the careful measurements of engineer Paris Herouni. In an interdisciplinary survey (1994-2001) Herouni mapped all 222 stones and their hole orientations, giving each stone a number of identification. Herouni, based on astronomical calculations (which incorporate the axial precession of the Earth) concluded that Zorats Karer was possibly as old as 5500 BC, and thus possibly the oldest astronomical observatory in the world.

He found dozens of sightlines to celestial objects: one hole in an upright megalith was discovered to point to the rising of Deneb (alpha Cygnus, one of the brightest stars) about 7,600 years ago. Herouni claimed that the site was in operation throughout the millennia - about 7700-2200 BC by his reckoning - to monitor the movements of stars and planets. To confirm this, he referred to 84 stone telescopes (the perforated stones) and estimated that certain of these alignments were very precise, within half a degree (30 arcminutes) of true celestial objects.

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Interestingly, the analyses of Herouni implied not only alignment with the Sun, but with certain stars at certain times: he argued that the holes were oriented to the heliacal rising and setting of bright stars such as Deneb and others as they would have been seen in the distant past. He even suggested an etymological relation between the name of the English stone circle Stonehenge and the name of this site in Armenia Karahunj, suggesting that the name of the English site may even have been named after this one in Armenia, a suggestion that has been widely denounced as indicative of his own interest in the primacy of Armenia in archaeoastronomy. Subsequent studies have increased and sharpened these archaeoastronomical hypotheses. There are now at least 17 known stones, with azimuths determined by observation to be either the Sun rise/set at solstices or equinoxes, and 14 stones, with their azimuths determined to be the extreme northern and southern moonrises - the lunar standstill positions in the 18.6-year cycle of the Moon.

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A mythological scene, showing two gods slaying the dragon Illuyanka (only partly seen on the picture). The limestone relief was a part of the Lions Gate at Milid / Arslantepe.

These alignments indicate that the creators of Zorats Karer were observing solar and lunar years, and the significant turning points of the annual solar path and the boundaries of the lunar path on the horizon.

It has also been observed that the northeastern avenue of the site, an 8-meter-wide row of stones running out of the center circle, appears to face either the rising Sun on the summer solstice (approximately northeast) or the rising point of Venus or the major lunistice moon, although interpretations vary. The variety of theories highlights the fact that numerous stones might have been used as purposeful sighting tools, whilst others might be accidental.

A very interesting theory links Zorats Karer to the constellation Cygnus. Cygnus was an animal with strong connection to the myth of the region - in Armenian sky lore this bird was called Angegh or the Vulture. The outline of the brightest stars of the Cygnus (Swan) constellation was noted

Dudlajzov / AdobeStock

by some Armenian researchers to be reflected in the pattern of the standing stones on the ground. This notion has some support in recent high-precision survey: laser scanning and drone photogrammetry since 2020 have found small “observational instruments” - flat platforms, paired angular stones, sightlines - all indicating that the skyscape was being observed intentionally.

The study of astrophysicist Hayk Malkhasyan and others shows that, throughout the various periods of construction, the location always focused on the area of the sky that Cygnus occupied. The star Sadr (g Cygni, at the center of the cross shape of Cygnus) would have been in the line of sight of some of the stones at a very important time: directly after the sun sets on the summer solstice, through a specific hole in the stone. This orientation was determined to have worked approximately 15,500 BC, indicating a staggering antiqueness of one stage of the monument use. In fact, Malkhasyan suggests that Zorats Karer contains several astronomical layers: an original sky-mapping at 16th millennium BC, an update at 9000 and 5800 BC, and a re-calibration around 2341 BC - each of which may have been a re-calibration of the layers corresponding to varying positions of the stars as a result of the precession process.

These assertions, once confirmed, would date the origin of the site to the Upper Paleolithic, and in spirit to other early sky-oriented sites (such as the vulture stone at Gobekli Tepe in neighboring Anatolia). At least, they highlight the ritual duration of Zorats Karer: generation after generation could have come to this place and celebrated solstices, watched the stars rise, and practiced a ritual communion with the world.

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Ancient Armenians and the Cosmos

The meaning of Zorats Karer can be explained by placing it into the historical and cultural context of the Armenian Highlands. The area has an extremely long history of human settlement and pioneering achievement. Less than a couple hours drive north of Karahunj lie caves containing what is believed to be the oldest known shoe in the world (ca. 3600 BC) and traces of viniculture around 4000 BC - the remains of Neolithic peoples becoming civilized. The societies in this region were already learning metallurgy, trade, and astronomy by the 5th-3rd millennia BC.

The early inhabitants of Armenia followed the skies to such a degree that they managed to work out a calendar, which, according to certain reconstructions, started in 2492 BC, an epoch that is associated with Armenian mythology. This date in Armenian mythology is linked to a mythical battle that was fought under the protection of Orion - the constellation is known as Hayk, the name of the culture hero who established the nation. Although mythical, such traditions suggest that the measurement of solar years and perhaps even the observation of precessional changes was something that early Armenian priest-astronomers could do.

By the Bronze Age (c. 3rd-2nd millennium BC), those in this land - the ancestors of the Hurrians, the Urartians, and the Armenians - reportedly had incorporated the celestial motives in their art and had constructed sanctuaries facing the skies. The depictions of the Sun, Moon, star patterns, and comets in Bronze Age rock art in nearby mountains confirm a cultural preoccupation with the phenomena of the heavens. Stone settings with points to the sunrise and the paths of stars date to ca. 2700-2500 BC and are present in other megalithic sites in Armenia such as Metsamor (near Armavir) and Sevsar.
The idea of bringing together stones to represent

tomb markers and to act as observatories was probably part of a wider practice in the highlands.

The peoples of ancient Armenia interpreted their terrestrial fate in the motions of celestial bodies. The standstill of the moon (when at its highest northern or southern rise) would have signaled agricultural and ritual calendars; pastoralists may have observed the appearance of stars such as Sirius or Aldebaran before the dawn; and the beginning of the seasons were announced by the rise of stars such as Sirius or Aldebaran. A large number of constellations in the Armenian tradition were named after an indigenous lore, and did not share names with the Mesopotamian or Greek, which suggests the existence of an ancient local lore of stars.

One such example is the identification of Cygnus as a vulture (a carrion bird of death and the sky) which sounds like an uncanny echo of the focus on this constellation in Zorats Karer. One can only imagine Bronze Age priests at Karahunj, standing atop the stone platforms during the time of the summer solstice, as the bright star Deneb (tail of the Swan) appears in the twilight, and they explain this dramatic action in the framework of their myths of the afterlife

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or rebirth. In this respect, Zorats Karer may have been both an astronomical observatory and a religious complex, associating the events in the sky with communal rituals - a place where the sky was not only looked at scientifically, but also imbued with meaning.

Some recent work does tend towards this integrative approach: a survey of ancient Caucasus astronomy made the remarkable finding that Carahunge was perhaps on two counts an astronomically oriented ritual site funeral tomb, and at the same time a ritual shrine devoted to a deified ancestor or heavenly god. This is consistent with the usage of many megalithic sites throughout the world, in a combination of practical astronomy and ceremonial value.

Science, Debate, and Ongoing Discoveries

The combination of megaliths and potential sky alignments is such a seductive feature of Zorats Karer that it has become a lightning rod between archaeologists and astronomers. Advocates of the observatory hypothesis - many of whom are astronomers by profession - have collected data on alignments and speculative models all the

way back to prehistory. However, numerous archaeologists call for caution, as they do not find any substantial chronometric data that the construction could take place earlier than the Bronze Age.

There were no large-scale excavations, so a radiocarbon or artifact typology does not contain the true age of the stone settings. There is no scientific disagreement among specialists on the monument, says Prof. Pavel Avetisyan of the Armenian Academy of Sciences, we know it is a multi-layered monument which needs to be excavated and studied over a long period. The co-leader of the 2000 survey, Avetisyan, writes that nothing beyond a doubt is incontrovertible to suggest that the standing stones form part of an observatory role - he describes the opinion that the monument is an ancient observatory... as “elementary charlatanism”, and as having nothing to do with science.

He and others note that the stone holes themselves need not be very old; the drill-work is fairly fresh and undecayed, and the holes may have been constructed in later ages, perhaps as archery-stands or otherwise. Moreover, such large holes are technically inconvenient to point at stars: a 5 cm aperture without a focusing tube provides a wide field of view - too large to point to the rising point of a specific star with the precision alleged. Herouni himself admitted it, and suggested that observers could have put wooden or obsidian tubes in the holes, or could have stood at a fixed distance behind the stones to reduce the viewing angle. No such supplemental tools (such as tube fragments or post sockets) have been discovered archaeologically, however, and these concepts are hypothetical.

In 2015, archaeoastronomer A. Cesar Gonzalez-Garcia critically reviewed the claims and found that most of the Carahunge alignments are less justifiable, and analogies to Stonehenge (since it is now believed not to be an accurate observatory) are not useful. In a nutshell, skeptics do not deny the fact that the location is old and spectacular - and that its main purpose is still to be discovered, by means of thorough archaeological excavation and contextual data. Meanwhile, other research groups are building the argument that the astronomy of Zorats Karer is not a mirage.

More importantly, the existence of several layers of construction at the site of Zorats Karer is now generally recognized. Even its opponents admit that it is a multi-layered, multi-use monument that must have been augmented or repurposed by various communities over a millennium or more. This implies that both camps might be partly correct: Zorats Karer might have been originally a ceremonial site of the Stone Age (or Early Bronze Age) oriented to the skies, and then used as a Bronze/Iron Age burial ground and fortress, with each successive generation leaving its mark.

The reality might be in the excavation data still to be collected. It is only now, decades later, that Zorats Karer starts to reveal some of its secrets, although a lot still remain unknown. The story of Zorats Karer is one where rigorous science meets enduring mystery: an ancient observatory or a Bronze Age necropolis, a place of sky worship or of ancestral memory – or perhaps, brilliantly, both. Each new piece of evidence brings us closer to the horizon of truth, even as the stones of Karahunj keep their silent vigil, aligned with the eternal stars above. ■

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ARKAIM

BY ALICIA MCDERMOTT AND MASSIMO BONASORTE

You stand before a perfect circle of ancient earthworks on the steppe. The Bronze Age settlement of Arkaim emerges from the vast plains of the Southern Urals. Arkaim is a mysterious site located in Russia, in the Chelyabinsk region, near the border of Kazakhstan. Experts believe the citadel, although not necessarily the oldest feature of the site, was built between the 17th and 16th century BC. But there are several reasons why Arkaim stands apart from other Bronze Age settlements in the area, leading to the idea it was built by a separate group. There is controversy on exactly who the builders were and what they made the site for, and that uncertainty has led to some fascinating, if unorthodox, claims.

An Unknown Civilization

Dated to between 2150 and 1650 BC, it belongs to the Sintashta culture, an Indo-Iranian people of the ancient Eurasian Steppe, and covers around 2 hectares with a walled circular plan about 160 m in diameter and walls some 5.5 m high, surrounded by a 2 m deep moat. Its discovery in 1987, just in time to halt the flooding of the site, surprised archaeologists under the leadership of Gennady Zdanovich. The entire complex covers approximately 20,000 square meters with an outer diameter of about 160 meters. Between the walls stood approximately 35-40 dwellings in the outer ring and 27 in the inner ring, all arranged in a radial pattern that created what some researchers have described as a swastika-like design when viewed from above. Russian archaeoastronomers have determined that the site allowed for observation of 18 astronomical phenomena using 30 distinct structural elements. This complexity exceeds Stonehenge's capacity, which tracks 10 phenomena using 22 elements.

Apart from its creators, another mystery is why the site was suddenly abandoned. There is some evidence of a fire, however that may not have been the cause of desertion. Because the site was fortified, some people believe it was abandoned when the inhabitants lost a war. Skeletons have been found at Arkaim and in the expansive necropolises of the valley, but the human remains do not generally suggest death

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BRONZE AGE OBSERVATORY OF THE SOUTHERN URALS

in battle. As with the mystery of its builders, there is also much confusion on Arkaim's original purpose. Legends suggest it was a holy city for rituals and ceremonies. However, it is evident that over time the location was also used as a fort. As with many ancient sites, it is likely that Arkaim served more than one need and the main purpose probably changed over time; this is supported by the archaeological findings which suggest that it was used over the course of millennia.

Today, Arkaim is sometimes called the "Land of Towns" due to its central location in relation to other nearby prehistoric sites and monuments. Arkaim has a complicated and prearranged plan. It is obvious that the society which built it was organized with a social structure and authority figure(s).

Its ruins show thick walls built in concentric circles. These circles were built around a main square, probably a ceremonial space, which contained about 60 dwellings. Each house had a hearth, well, cellar, and an oven which was used to fire pottery and smelt bronze. Although there is evidence of a fire damaging Arkaim, the ruins show a fireproof substance was also included in the construction of some of the structures.

The House of Yima

Arkaim has a twin-ring layout: two concentric walls built of timber-framed clay, inside which lay rows of dwellings, hearths, wells, even metallurgical furnaces. These houses open onto a paved inner street lined with drainage channels, all radiating toward a central square of roughly 25 by 20 m, accessible through four gateways positioned on the cardinal points. That design is not a defensive quirk: it's a cosmic blueprint, echoing Indo-Iranian texts like the Rigveda, where the mythic "House of Yima" is a circular cosmic model with four entrances.

Yet the real fascination lies in what the skies tell us. Scholars have suggested that Arkaim functions as a Bronze Age observatory. Careful examination shows the four entrance passages align with solstitial and equinoctial directions. You could move through those gates and trace the path of the Sun and the seasons. The settlement's shape - concentric rings and radial streets - forms a pattern reminiscent of a mandala or even a swastika, a symbol standing for life, movement, and seasonal turning.

From the center, the placement of dwellings and gateways aligns with sunrise and sunset positions at solstices, hinting that the builders had a functional use for astronomical cycles. Doors were placed in alignment with the rise and set of the sun and moon so that the original builders could observe at least 18 astronomical events, making Arkaim both more ancient and accurate than Stonehenge.

The preciseness of Arkaim's spiral buildings strongly suggest their use as astronomical observatories and calendars. Russian archaeologist K.K. Bystrushkin, who made the comparison between the two famous sites in 2003, said Stonehenge offers an observational accuracy of 10-arc minutes to a degree, but Arkaim surpasses it with an accuracy of one-arc minute.

"*Stonehenge allowed for, and possibly may still allow for observations of 10 astronomical phenomena using 22 elements, whereas some archaeoastronomers claim that Arkaim allows for observations of 18 phenomena using 30 elements. This essentially means that certain events in the sky could be observed and tracked by using the site in particular ways and from different positions, and that Arkaim offered more observable events than Stonehenge.*" (Mysterious Universe).

Note that the buildings at Arkaim also pre-date similar formations used by ancient Egyptians and Greeks, suggesting an early in-depth understanding of the Earth in relationship to the rest of the universe.

The amazing knowledge of astronomy which is evident in its ruins, as well as the mystery behind its builders and abandonment, have led several scholars to say an advanced civilization once lived at Arkaim. Socially, Arkaim's layout speaks volumes. The synchronized arrangement of dwellings, central square, radial streets, and cardinal gates suggests collective life organized around cosmos-based ritual and governance. Scholars posit that 1200–2500 individuals lived within those concentric circles. This was not a haphazard settlement but a planned city-state with elite decision-making, perhaps priest-kings using cosmic alignment to assert their authority.

For you, the visitor, Arkaim is a miniature cosmos—where house, street, gate, and sky form a single ritual stage. It isn't enough to marvel at the geometry: you feel the pulse of seasonal time encoded in stone. You sense that its founders carved not just a city, but a living calendar, a ritual horizon, and a lasting bridge between earth and sky. ■

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Archaeoastronomy is the science that studies the astronomical knowledge of ancient populations and its connections with the social and religious life of the period. Europe is rich in extraordinary sites with astronomical orientations. Among these, there are numerous examples in Italy, where three particularly important areas stand out: Sardinia, Valle d'Aosta, and Puglia. The variety of Sardinian sites is exceptional: the island features examples of menhirs (standing stones), cromlechs (circles of standing stones, although the layout of the monument can sometimes be elliptical or other shapes), alignments (rows of aligned menhirs) and dolmens (megalithic structures consisting of several upright stone slabs and one or more covering slabs). In addition to these classic megaliths, there are other structures that are characteristic of the region and extremely unusual, such as the tombs of the giants, the domus de jana (fairy houses, carved directly into the rock, recently declared a World Heritage Site), sacred wells, and numerous nuraghi.
The latter are cylindrical or truncated cylindrical towers, probably dating back to the Bronze Age, which can be found in their thousands throughout Sardinia.

Italian archaeoastronomy between ritual landscapes, urban planning, and medieval symbolism.

The Universe in Stone and Light

BY GUIDO COSSARD

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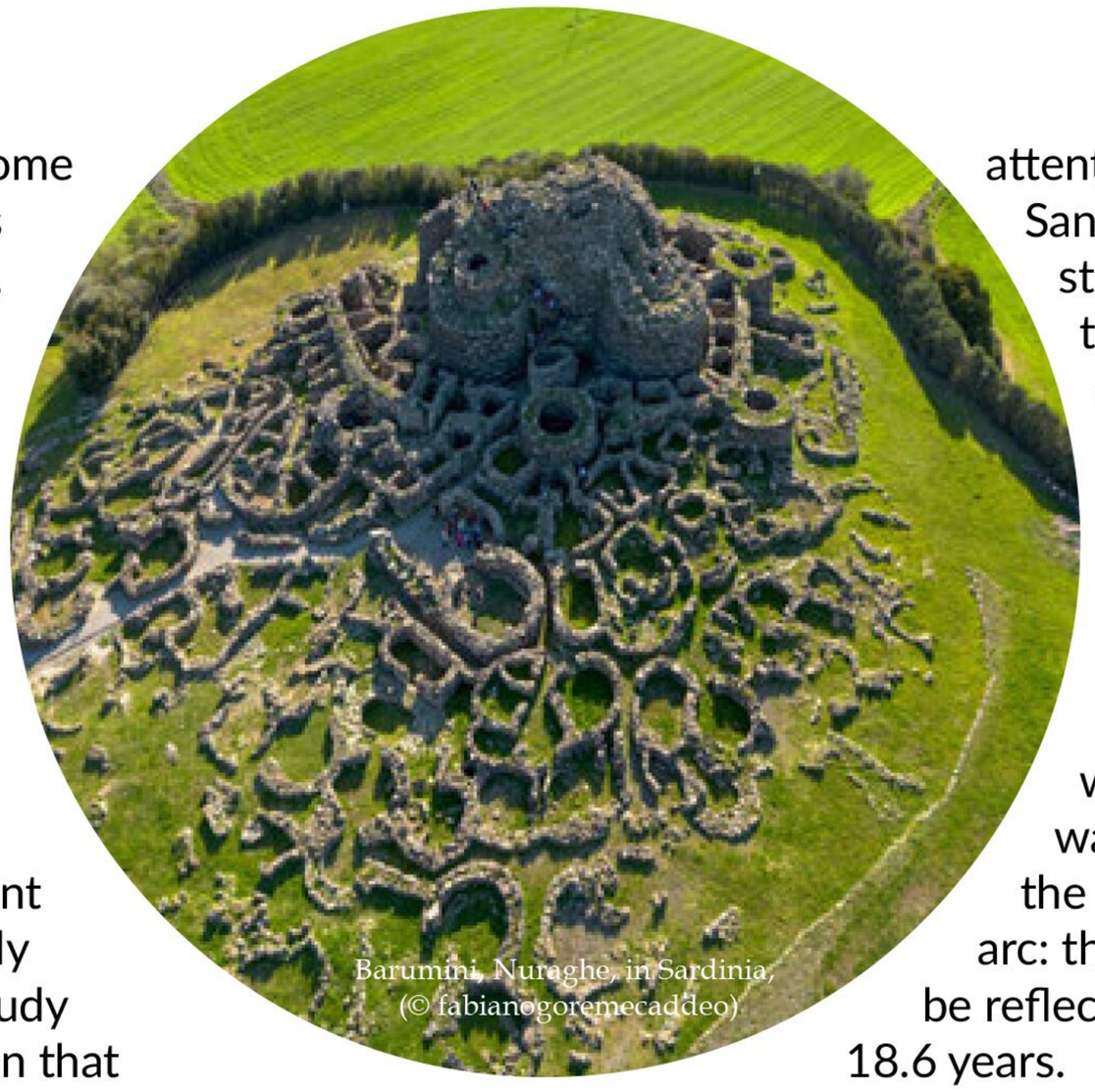
The nuraghi may have had a defensive purpose, although archaeologists have put forward numerous hypotheses about their use and heated debates have ensued. Astronomical studies carried out on these prehistoric monuments have led to extremely interesting results, considering that many nuraghi have entrances oriented towards the meridian line, while others are directed towards the point of sunrise on the day of the winter solstice. In addition, stellar orientations have also been

The entrance of the Santa Christina's Well in Sardinia. (© Andrea Raffin.)

identified: the openings of some nuraghi are directed towards points on the horizon where, around 2000-1000 BC, bright stars such as Sirius and Rigil, the brightest star in the constellation Centaurus, rose. The sacred wells deserve a separate mention, in particular the well of Santa Cristina, an ancient lunar observatory located near Paulilatino (Cagliari). In ancient times, the Moon was carefully observed, even though its study was much more complex than that of the Sun. In fact, the complex apparent motion of the Moon in the sky lasts a full 18.6 years, because during this period the Moon's entire orbit completes a full rotation around the Earth. At certain moments during this period, the Moon follows arcs in the sky that are much higher than the summer arc of the Sun and then much lower than the winter arc of the Sun. These moments were followed with great attention in ancient times. The Santa Cristina well has a long stone staircase that leads to the base of the well, which is about six meters deep. The angle between the base of the well and the opening, relative to the vertical, is approximately 11.4 degrees. This angle allows the Moon's rays to penetrate the well and be reflected in the water at the bottom only when the Moon follows its maximum arc: therefore, the full moon could be reflected in the well only every 18.6 years.



Barumini, Nuraghe, in Sardinia, (© fabianogoremecaddeo)

Megaliths and Dolmen in Puglia

As for Puglia, there are numerous megaliths on its territory and, from an astronomical point of view, its dolmens are particularly important.

We will mention a few examples; the most famous is undoubtedly the dolmen of Bisceglie, also known

The Dolmen in Montalbano.

Dolmen in San Giovanni.

Saint-Martin-de-Corléans.

Saint-Martin-de-Corléans.

as the Chianca dolmen, which consists of an entrance corridor and a chamber almost two meters high, covered by a single enormous slab. Its corridor is oriented towards the point where the Moon rose when it reached one of its highest points in the sky.

The dolmen of Corato has a large chamber and its axis is oriented along the equinoctial line, like that of the dolmen of Torre Ospina, located near Recale.

The Giovinazzo dolmen, which dates to 1800 BC, has lost its specchia, i.e., the mound of earth and stones that covered it. Currently, two entrance corridors are visible, one of which is oriented along the meridian line.

Saint-Martin-de-Corléans.

The Stabile dolmen, on the other hand, is a very well-preserved structure, covered by a 2.6 x 2.3-meter slab; the entrance to this dolmen faces the point where the sun rose on the day of the winter solstice. This solstice direction is shared by another well-preserved dolmen located near Minervino (Le), the Scusi dolmen.

In Search of Orion, The Hunter

The Aosta Valley is also rich in megalithic remains.

One site stands out above all others in terms of chronological continuity: the megalithic area of Saint-Martin-de-Corléans (Aosta). Studied in detail by the author in 1991 (G. Cossard, F. Mezzena, and G. Romano), the megalithic site has revealed numerous important astronomical alignments. The sacred area includes numerous monuments that archaeologists believe were built in several phases, the oldest of which dates back to the 5th millennium BC, when ritual plowing was practiced on a vast area of land, along a line directed towards a sector of the mountain to the south, whose profile was followed at length by the Moon, as if the astro-god wanted to descend to Earth at a particular moment during its complex 18.6-year cycle.

The Stars, in Saint-Martin-de-Corléans.

This line would serve as a reference point for the structures that would be built in the following millennia.

In the second phase, between 4300 and 3950 BC, large, aligned pits were dug, probably ritual wells, again directed towards the mountain profile over which the Moon seemed to crawl.

During the third phase, from around 2900 to 2500 BC, an alignment of poles was erected, followed by several alignments of steles, some of which were extraordinarily decorated. again, the builders of the area took into account astronomical guidelines, many dedicated to the Moon, but also to the rising point of Betelgeuse, the brightest star in the constellation of Orion.

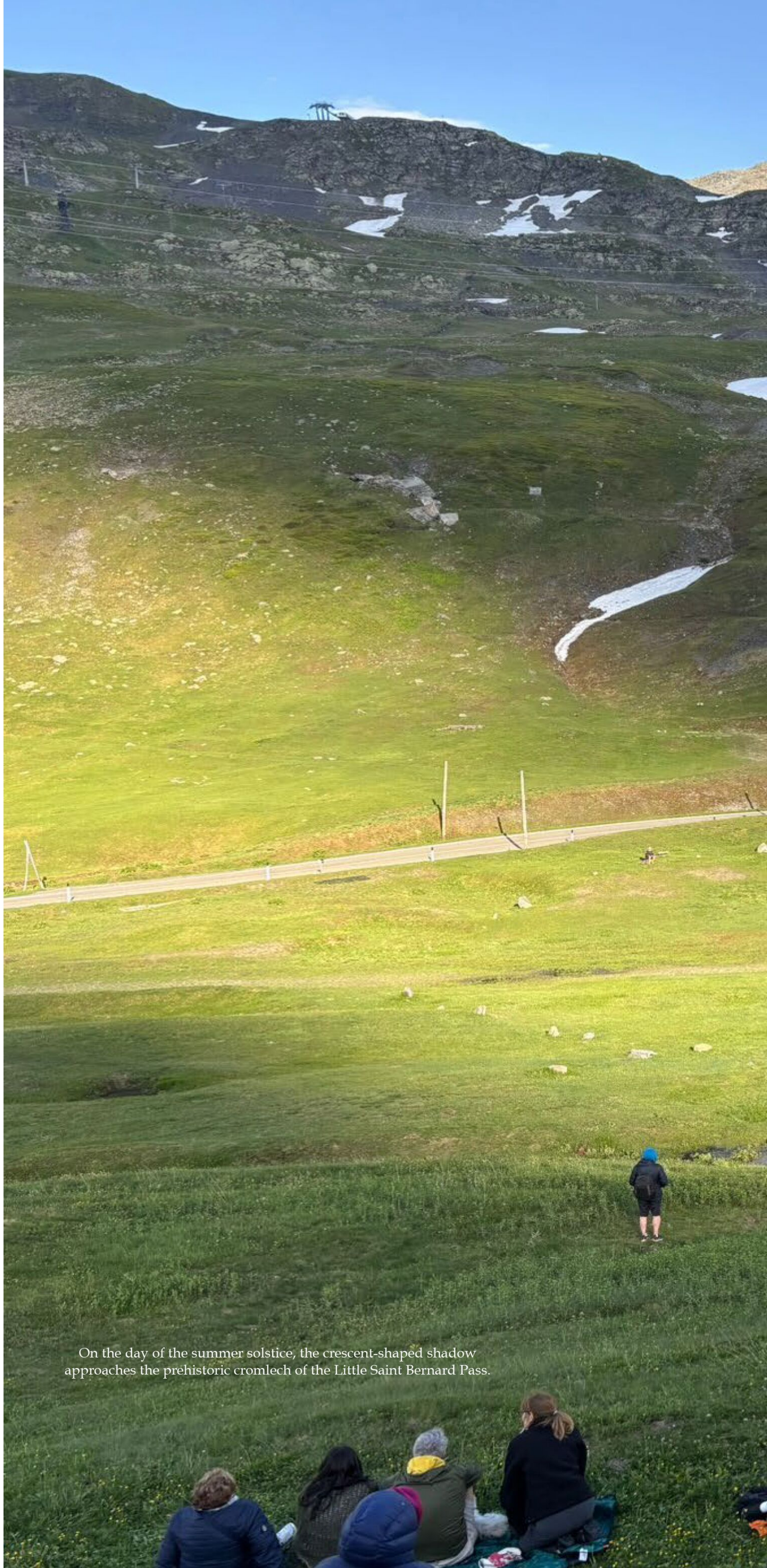
These orientations were maintained during the monumental phase of the site, which lasted from 2700 to 1600 BC, when dolmens and an allée couverte were built. Significantly, it was only during this period that solar orientations were introduced, specifically at sunset on the winter

The oriented menhir of Maklavun projects an image of the Sun during the equinoxes.

solstice (for more information: Academia: Guido Cossard, New astronomical studies according to the new dating of the megalithic area of Saint-Martin-de-Corléans).

Also significant is the construction of a small medieval church dedicated to Saint Martin, who was canonized precisely for his tireless work in Christianizing previous places of worship. Finally, the modern parish church, inaugurated in 1976, confirms the incredible continuity of worship: the district of Saint-Martin-de-Corléans in Aosta is the only place in the world that can boast, and demonstrate,

Part of the cromlech at the Little Saint Bernard Pass.



On the day of the summer solstice, the crescent-shaped shadow approaches the prehistoric cromlech of the Little Saint Bernard Pass.

continuity of worship in the same place for more than 6,000 years.

Another significant site in the Aosta Valley is the cromlech located on the Little Saint Bernard Pass. The highest circle of standing stones in Europe, given its altitude of over 2,000 meters, currently consists of 46 stones. However, thanks to some historical texts, we know that this was not always the case: in ancient times, there were at least 50 monoliths. The stones are not very tall, rising from the ground to a height of between 22 and 50 cm, but the diameter of the circle is remarkable, measuring 72 meters, although ancient texts, not always considered reliable, claim that the circle was once elliptical in shape, with axes measuring 72 and 84 meters.

The vast stone circle that stands on the Little St Bernard Pass has a fortunate and almost unique characteristic, that of having an ancient text specifically dedicated to it. This is the Satiricon, by Petronius Arbiter, who writes:

"In the Alps near the sky, in the place where, moved aside by the divine power of Graius, the rocks lower and allow themselves to be crossed, there is a sacred place where the altars of Hercules rise: winter covers it with persistent snow and raises its white head towards the stars."

Ueuaphoto / AdobeStock

The place was considered sacred because of the very presence of the pass, because it was located on the watershed, and because two important natural sundials are visible from there. The first is Mont Blanc, which, seen from the Little St. Bernard Pass, looks like a giant index finger pointing to the North Star and therefore to the north. Furthermore, on the day of the summer solstice, the sun setting in a saddle near the summit of Mount Lancebranlette produces a semicircular shadow; in this way, a crescent-shaped shadow suddenly stands out, approaches the cromlech, exactly outlines its northwestern part, and seems to stop there for a few seconds, as if to celebrate the summer solstice.

Especially in the Alps, there are numerous prehistoric sites characterized by cup-marked rocks; these rocks are distinguished by the presence of cup marks on their surface, i.e., hemispherical excavations made by human hands in the stone; their meaning is widely debated by archaeologists: what is interesting to us is that some of them represent celestial constellations. As an example, we will mention

Representations of the constellation Perseus using cup marks, at Rocceré.

The Porta Palatina, still perfectly preserved,
was one of the gates of the Roman city of Augusta Taurinorum.

Cestia Pyramid in Rome.

Castel Del Monte, in Puglia. (© AdobeStock)

the triple representation of the Little Bear, located at the site of Bard (Aosta Valley), and a large anthropomorphic figure carved on Rocceré, in Valmaira (Cuneo, Piedmont), which reproduces the constellation of Perseus with great precision.

Although megalithic sites are extremely important because of their age, archaeoastronomy also takes into consideration other notable situations, among which we would like to mention the orientation of cities of Etruscan and Roman origin.

The Universe is Moving!

The Etruscans believed that the motion of the stars, due to the rotation of the Earth, was real and not apparent; therefore, they believed that the entire universe rotated on an axis oriented towards the North Star (which at the time was not our North Star, Alpha Ursae Minor or Polaris, but the reasoning remains the same).

Therefore, if the city was to be in harmony with the universe, its axis had to be parallel to the axis of the entire cosmos, precisely to the line along which the entire celestial vault seemed to rotate.

Consequently, the cardo, which was the main street of the city, had to be strictly directed along the north-south line. Subsequently, the decumanus was traced perpendicular to the cardo, thus following the east-west axis. The Etruscan city of Marzabotto, ancient Misa, still preserves traces of its ancient orientation in its urban layout, which deviates only a couple of degrees from north. The orientation of Roman cities is nothing more than an adaptation of the Etruscan custom, which the Romans initially applied in its entirety.

Later, the Romans reversed the order of the two actions, probably because this procedure was easier from an operational point of view. In this way, they first oriented the decumanus, directing it towards the point where the Sun rose on the day the city was founded, and then traced the cardo so that it was perpendicular to the decumanus. Although the gromaticians (the name derives from the use of the groma, an instrument used to ensure the perfect perpendicularity of the city's axes) of the old school disapproved of this new way of orienting cities, this method nevertheless became the dominant one.

The traditionalist gromatici rightly argued that this method was much less significant than the previous

one, because the point where the Sun rises on the horizon changes depending on the day of the year. However, despite the thinking of the old gromatics, the introduction of this new method by the Romans allows us today to date the foundation of Roman cities. In fact, by determining the correct orientation of the decumanus, it is possible to trace the day of the city's foundation from the position of the Sun. The founding dates of various cities are thus known. Turin, the ancient Augusta Taurinorum, has its decumanus pointing towards the point where the sun rises in early February, with possible different interpretations: February 2, the Celtic festival of Imbolc, or February 4, the celebration of Pater Patriae, a title attributed to Augustus. Augusta Paetoria, now Aosta, has its cardo pointing towards the point where the Sun rises on the winter solstice, which in 25 BC fell on December 23. The orientation towards the winter solstice is shared by Iesi. To all these examples must be added the churches and castles of the medieval period.
An example of the first type is the cathedral of Bari, whose rose window projects a beam of light on the day of the summer solstice onto a circular mosaic in the floor. As an example of the second type, how can we forget the splendid Casteldelmonte in Puglia? This structure, which some consider more of a manor than a castle, respects various astronomical references, as well as having an octagonal plan with eight towers, also octagonal, at the vertices. It is certainly not necessary to emphasize the profound symbolic meaning of the octagon, particularly with its implications in terms of representing infinity. ■

View of the magnificent Castel del Monte, in Puglia.
(© AdobeStock)

Where Ancient Walls Align with the Stars

ACROPOLIS OF

Atop a limestone hill in central Italy, the Acropolis of Alatri rises 500 m above the surrounding valley, crowned by majestic polygonal stone walls encircling a sacred precinct. This ancient citadel – known locally as the “Civita” – dominates the modern town of Alatri and has earned the nickname “City of the Cyclopes” for the giant polygonal blocks that form its walls. Yet if you stood at sunrise on the summer solstice, the Sun would rise directly in line with the acropolis’s northeast corner. This is not a coincidence: it is the result of intentional planning by ancient builders who aligned their city with the Sun and stars.

Visitors approaching the acropolis are immediately struck by the scale and precision of the masonry: massive irregular boulders fit

ALATRI

A HILLTOP CITADEL OF CYCLOPEAN STONE

BY MASSIMO BONASORTE

GiuliovRomanov, pinting of Polyphemus.

together so perfectly that not even a sheet of paper can slide between them. In 1859, the German historian Ferdinand Gregorovius marveled at this "*marvelous masonry, which equals in size any Egyptian building*", calling Alatri's megalithic acropolis "*the most astounding monument of the past in Latium*" and confessing he was more awed here than by the Colosseum in Rome. Over a century and a half later, the scene remains just as impressive, with the *Cyclopean* walls of Alatri still standing silent guard over the landscape. Alatri (ancient *Aletrium*) was one of the principal towns of the Hernici, an Italic people who thrived in this region before the rise of Rome. The acropolis they built showcases the finest polygonal masonry in Italy – a construction style often called

Cyclopean because later Greeks and Romans imagined that giant Cyclops masons must have piled these enormous stones. In Alatri's walls, no mortar was used; gravity and masterful cutting alone have held blocks weighing dozens of tons in place for over two millennia. The acropolis' ground plan is a trapezoid enclosing roughly 1.9 hectares, with the walls still towering up to 15 m high in places. Their state of preservation is exceptional: the joints are so tight after ages that archaeologists consider Alatri's Cyclopean citadel among the greatest megalithic achievements of the ancient Mediterranean.

Architecture and Mystery

Alatri's acropolis is a geometric masterpiece on a natural hilltop. The layout is organized around a central point (identified by archaeologists as point O), from which the architects laid out symmetries and distances. For example, city gates on opposite sides of the acropolis are placed at equal distances from this central point, forming a radial pattern. The most remarkable alignment is the one mentioned above: from point O to the north-east corner

Giambattista / AdobeStock

of the enclosure. If you stand at O and look toward that corner, you are looking at the spot on the horizon where the Sun rises on the summer solstice (around June 21). This means the acropolis was intentionally oriented to mark the longest day of the year, a time of great significance in agrarian calendars.

Not only that, but the eastern and western walls of the acropolis run almost exactly along the north–south axis. In other words, two long sides of the rectangular enclosure are cardinally oriented. This precise north–south alignment is rarely a fluke of terrain. In Alatri, the hill's natural shape did not dictate the walls – on the contrary, the ancient engineers sculpted the bedrock of the hill to fit their desired orientation plan. The southern side of the acropolis, where the main entrance lies, is slightly angled rather than being a perfect east–west line. It actually consists of two segments, one oriented about 4.7° west of due south and the other 3.4° east of due south. At first this asymmetry puzzled researchers. If the builders knew the cardinal directions and aligned one axis to north–south, why didn't they make the southern front a straight, perpendicular line?

The mighty enclosure of the Alatri acropolis has two main entrances. The Porta Maggiore, or Great Gate, on the south side is especially breathtaking: it is surmounted by a single monolithic lintel about 5 m long and weighing an estimated 24 tons. On the opposite (north) side, a smaller Porta Minore (postern gate) provides secondary access through the thick walls.

Uniquely, the builders left a mysterious carved symbol above this smaller gate – three stylized phalluses arranged in a T-shape, often called the “Triple Phallus”. This emblem (likely meant as a fertility or protection charm) is the only known inscription or mark left by the original architects. Along another sector of the wall, three large niches were cut into the stone blocks at ground level, each roughly 2 m tall, which probably once held statues gazing outward. These niches have no defensive purpose and hint at a ceremonial aspect to the citadel’s design.

Inside the acropolis, the ground slopes up to a leveled summit that today hosts a medieval cathedral. The cathedral’s foundations incorporate much older stonework – the lowest courses of its walls belong to an ancient temple that once occupied this sacred summit. Excavations have also uncovered the podium of another archaic building (6th–5th century BC) on the acropolis, suggesting that Alatri’s hilltop was a religious center even in pre-Roman times. In front of this temple platform, a natural cleft in the bedrock was identified as a likely foundation deposit – a place where the city’s founders buried offerings at the time of the acropolis’ construction. Such findings reinforce the notion that Alatri’s citadel was not merely a fortress, but a sanctified space of ritual.

Despite the intimidating scale of its walls, the Acropolis of Alatri does not resemble a typical military fort. Notably, the Cyclopean ramparts lack towers, bastions, or other overt defensive structures.

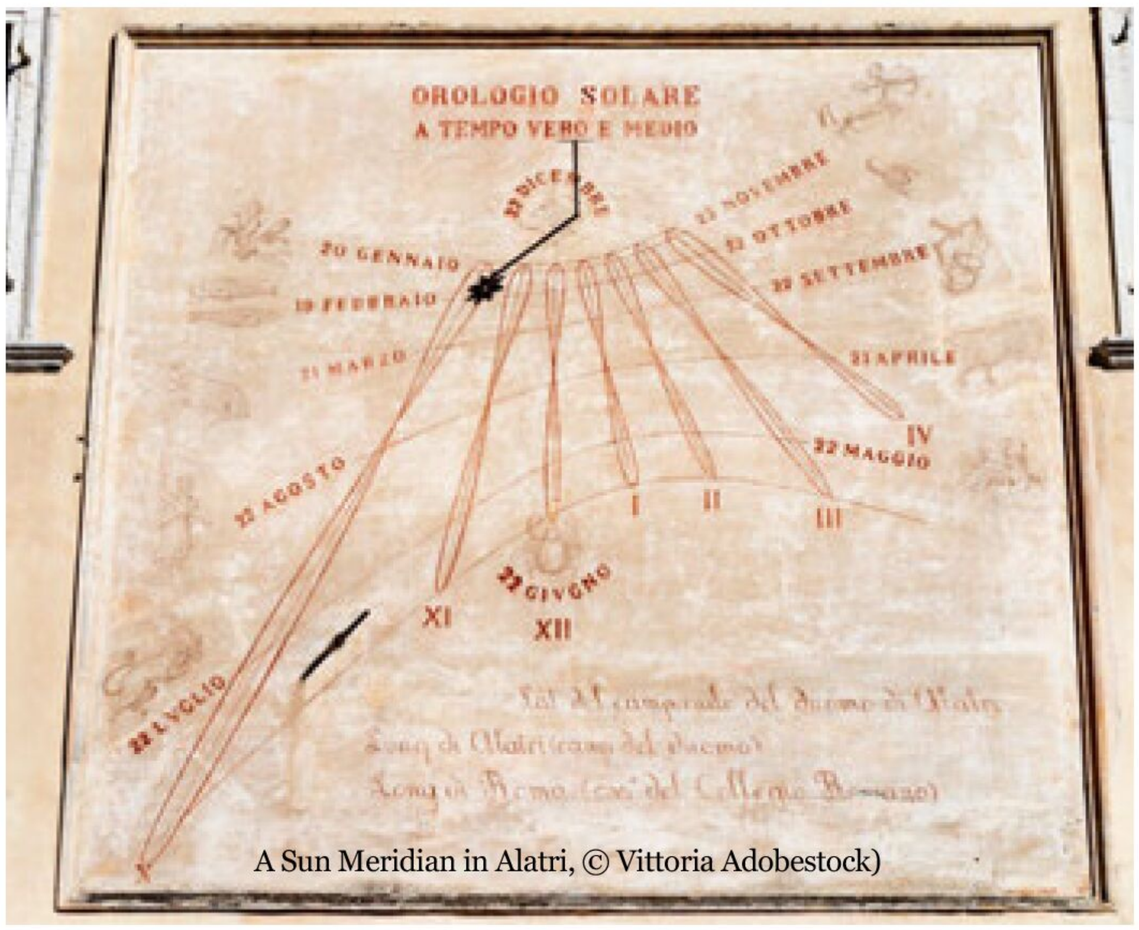
They are pierced by multiple gates and feature design elements (like the statue niches) that would be superfluous in a purely defensive work. Scholars have observed that Alatri's enclosure is much more akin to a sacred precinct – a grand stone temenos or holy sanctuary – than to a fortress. This interpretation dovetails with the archaeological evidence of temples and altars on the summit. It appears the ancient builders shaped Alatri's acropolis as an earthly stronghold for the gods, where monumental architecture served religious and ceremonial purposes as much as practical ones.

Celestial Alignments and Archaeoastronomy

One of the most intriguing aspects of Alatri's acropolis is its apparent alignment with celestial events. The idea that the site was planned with astronomy in mind was first proposed by local historian Giuseppe Capone in the 1980s, and later studies have confirmed several archaeoastronomical alignments in the acropolis layout. In fact, Alatri has been called "*the most spectacular example of the use of geometry and astronomy in planning*" among ancient Italian sites.

The two southern wall alignments match the rising or setting points of stars in the Southern Cross–Centaurus group as seen in antiquity. Around 400 BC, for example, the three upper stars of the Southern Cross (Crux) were visible from Alatri (the lowest star was below the horizon due to Earth's precession). At the same time, one of the brightest stars of Centaurus – Hadar – was visible, while its twin star Rigel Kentaurus had just dipped out of view. Calculations show that when the southernmost star of Crux was at an azimuth of ~184.7° (about 4.7° west of south), Hadar would be at ~176.6° (3.4° east of south). In other words, the two angled segments of the southern wall point to where those stars would appear on the horizon. Magli argues this is a deliberate orientation to the Southern Cross constellation and Centaurus. These stars were important in Mediterranean Bronze Age cosmology, often associated with navigation or cosmic south in various cult sites. By planning Alatri's acropolis with this alignment, its builders were likely connecting their city to the southern sky – a tradition not seen in later Roman architecture, further indicating a pre-Roman origin.

Turning to the northern sky, another striking alignment emerges. Capone, a local historian, had



A Sun Meridian in Alatri, © Vittoria Adobestock)

Ancient bas-relief depicting an eagle carved at the base of the highest point of the acropolis of Alatri.

boldly suggested in 1982 that the ground plan of Alatri's acropolis was conceived as an image of the constellation Gemini. Decades later, computer simulations of the sky around 400 BC lent credence to this idea. In that epoch, the bright star Capella (in Auriga) was setting on the north-western horizon at roughly 302°–304° azimuth (~32° west of north). At the very same time, the constellation Gemini (the Twins) was also descending, and notably it appeared in a polygonal shape uncannily similar to Alatri's acropolis outline. In the sky, Gemini's pattern had a

bent shape, and its “bent” side was oriented toward Capella – just as Alatri’s north-western wall has a bent configuration facing the point of Capella’s setting. This suggests the planners may have intentionally shaped that side of the enclosure to mirror the celestial image of Gemini, aligning the structure with the simultaneous setting of a prominent star and constellation.

The notion of laying out a city as a terrestrial reflection of a constellation might sound astonishing, but it has parallels in other ancient cultures. For instance, ancient Maya architects oriented temples to key stars and created sight-lines for celestial events, and Inca urban planners in Cusco may have aligned their city’s shape to a sacred constellation. In Alatri, the case for a Gemini blueprint is supported by both the unusual ground plan and the star alignment occurring at a plausible construction date.

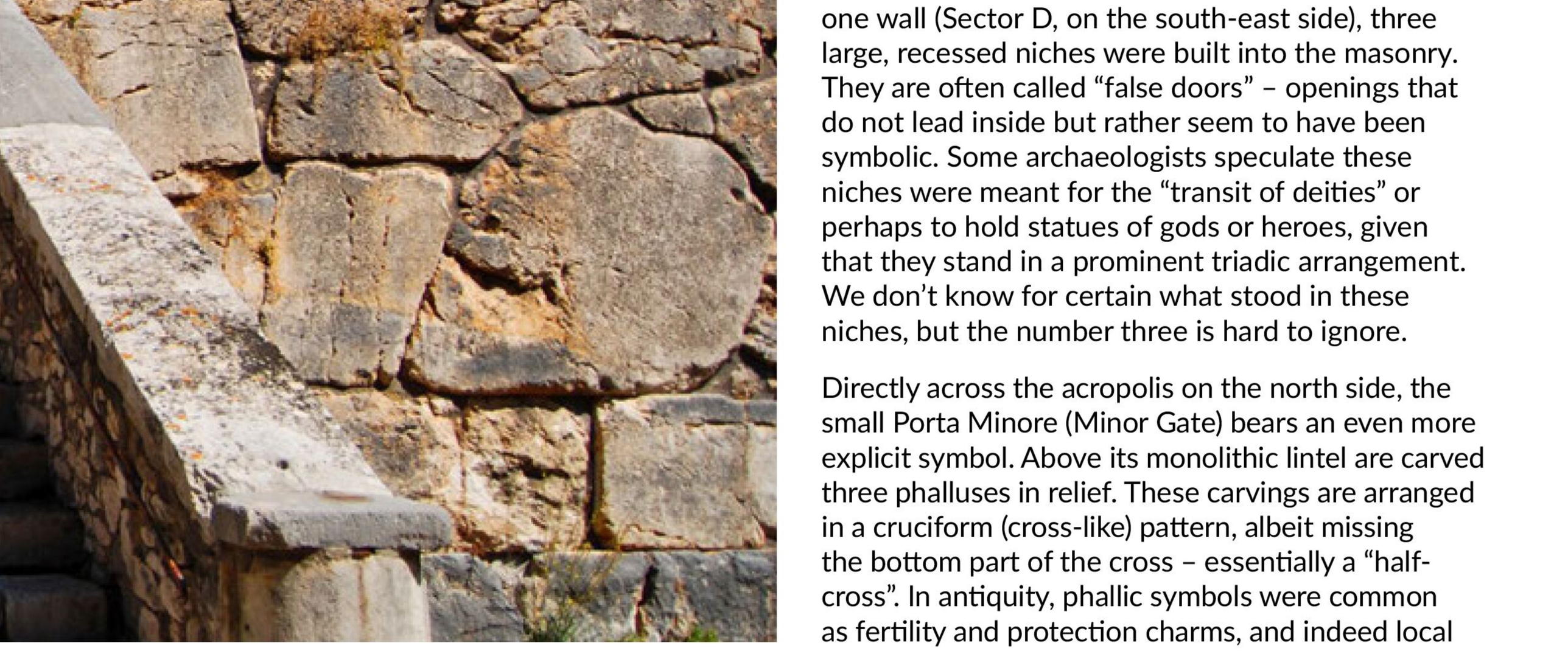
It’s important to note that thus far no clear evidence has emerged of alignments to planetary risings (such as Venus or Jupiter) at Alatri – the identified targets are the Sun and fixed stars. The focus on solstices and bright stars suggests the intent was calendrical and symbolic rather than, say, tracking a planet’s cycle. If such planetary alignments existed, they have not been documented in the scientific literature consulted.

Three Niches and a Half-Cross

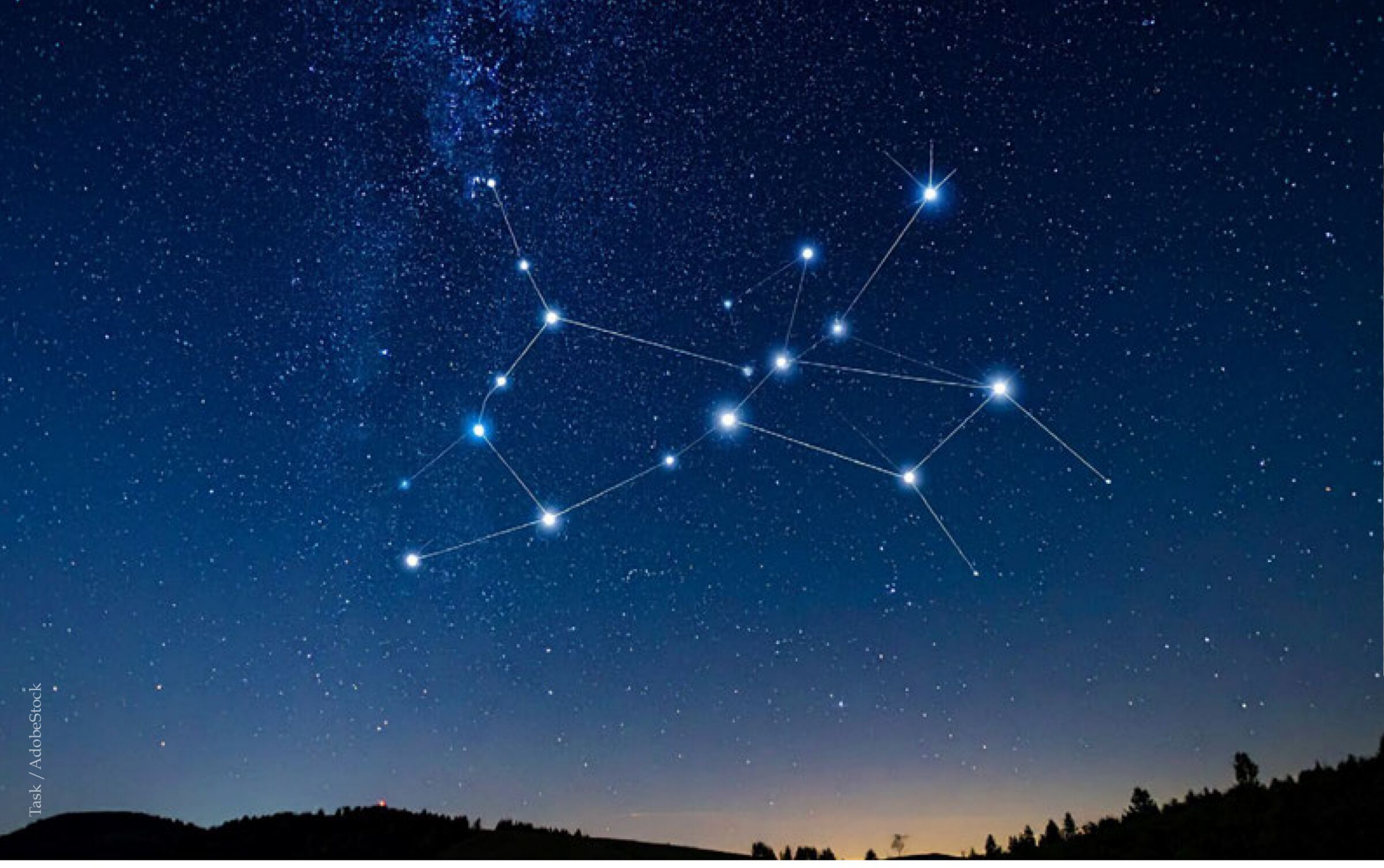
The Alatri acropolis holds a couple of enigmatic features that likely carry symbolic meaning connected

to these celestial alignments. On the inner side of one wall (Sector D, on the south-east side), three large, recessed niches were built into the masonry. They are often called “false doors” – openings that do not lead inside but rather seem to have been symbolic. Some archaeologists speculate these niches were meant for the “transit of deities” or perhaps to hold statues of gods or heroes, given that they stand in a prominent triadic arrangement. We don’t know for certain what stood in these niches, but the number three is hard to ignore.

Directly across the acropolis on the north side, the small Porta Minore (Minor Gate) bears an even more explicit symbol. Above its monolithic lintel are carved three phalluses in relief. These carvings are arranged in a cruciform (cross-like) pattern, albeit missing the bottom part of the cross – essentially a “half-cross”. In antiquity, phallic symbols were common as fertility and protection charms, and indeed local



The megalithic stonework of the walls of Sacsayhuamán in Cusco, shown here is similar to that at Alatri. (© Amalia Adobestock)



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lore calls this the “Gate of Fertility”. However, Giulio Magli and others see a double meaning: the three-pronged “half-cross” symbol corresponds to the three stars of the Southern Cross that were visible in Alatri’s sky during the Iron Age. In the time of the acropolis’s construction, Acrux (the fourth star of Crux) was invisible below the horizon, so the constellation literally appeared as a three-star half-cross. The ancient builders may have marked this fact in stone. The number three recurs in the niches and the lintel carving, hinting that it was a sacred or significant number in the site’s design – possibly referencing triads of deities, or the three visible stars, or both.

The niches are on the southern wall segment that faces where the Southern Cross sets, reinforcing the idea that they and the half-cross symbol work together as a code. It’s as if the architects left us two clues: a trio of niches and a triple phallus carving, both pointing to a celestial “three”. This kind of symbolic integration – blending religious iconography (fertility symbols, sacred numbers) with astronomy – suggests the acropolis was as much a ritual monument as a fortress.

Key cosmic correspondences identified by researchers include:

Solstitial Sunrise Axis: A line drawn from the acropolis’ central foundation point (the presumed site of the foundation deposit) to the north-east corner of the walls points directly to the rising Sun on the summer solstice. In other words, on the longest day of the year the Sun climbs above the horizon in perfect alignment with this engineered axis – a likely intentional feature to mark the solar year’s cycle.

Cardinal Orientation: The east-west length of the acropolis walls almost extends due northsouth. This cardinal orientation tells us that the builders had a great sense of direction and that their construction was oriented with the cardinal directions, as is common to most sacred buildings.

Stellar Alignments to the South: the south walls of Alatri appear to be facing some bright stars in the southern sky. In particular, the location of one component corresponds to the ancient loci of the Southern Cross constellation (Crux) when it was overhead in central Italy and the other component points to the luminous star Hadar (Beta Centauri). As the sky shifts slowly (precession), the Southern Cross is no longer visible above the horizon in contemporary Italy - it fell below the horizon somewhere in the 1st millennium

Ancient bas-relief on the megalithic walls near Porta Bellona.

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BC - the stellar alignments thus suggest that the acropolis was built when the stars still rose above the southern horizon.

A Citadel in the Shape of the Stars

The acropolis of Alatri could even be coded to be in the form of a set of stars. The irregular four-sided perimeter (wider on the west, and in the plan bent) has been observed to follow very closely the form of the constellation Gemini (the Twins) when it sinks behind the north-western horizon. Specially, the north-western kink of the acropolis has been observed to take the form of a bend of the constellation Gemini (the Twins), and to be oriented toward the setting point of Capella, a bright star that was sinking in the same direction around 400 BC.

There is also a possibility that the ancient designers were simply actually drawing the divine hilltop by depicting an image of the sky on the ground. Such remarkable coincidences are strong indications that the architects of Alatri were applying astronomy to architecture on purpose. It might be possible to position a temple to the direction of the summer solstice sunrise, for example, so that priests could indicate the transition of the seasons, a ceremony that carried both agrarian and spiritual connotations. Similarly, the alignment of walls to conspicuous stars may also have been intended to venerate certain star gods or to place the city in symbolic contact with the universe.

Perhaps most crucially, the star groupings provide a clue to the age and the culture of the acropolis. Since the Southern Cross stars lost their visibility in Italy around 700 BC, the

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alignments with that constellation suggest that, although the plan of Alatri was not made before that time, it is intended to be made before that time. Furthermore, subsequent Roman architects did not habitually include alignments with the southern stars in their urban layouts, but the Bronze Age and Iron Age civilizations of the Mediterranean (including Malta and Minorca, and more) did consider stars such as Crux and Centaurus. This indicates that the Alatri acropolis must have been planned by a pre-Roman folk who had a good sky-watching tradition, possibly the same people who gave rise to the Hernici, or some other Italic folk who were strongly conditioned by earlier Mediterranean astronomy.

Origins, Legends, and Legacy

Who exactly were the master builders of the Acropolis of Alatri? This is a question that puzzled intellects and spawned both serious studies and fantastic accounts. In the 19th century, early antiquarians argued about whether these Cyclopean structures were Roman or much older. By the mid-20th century, mainstream archaeology was inclined to date the polygonal walls of Alatri to an early Roman Republican project (4th-3rd century BC), going so far as to coin the term opus siliceum to describe this form of masonry as a variant of Roman practice. But a purely Roman origin has since been thrown into doubt by the accumulating evidence.
The astronomical alignments and

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the finding of a temple dated 6th-5th century BC all point to an earlier date, probably in the pre-Roman Iron Age.

The case that the acropolis of Alatri was constructed within the same time period (or possibly even earlier) is further reinforced by comparisons with other such masonry at Greek sites (such as the polygonal wall at Delphi dated to the 6th century BC). Most scholars now think that the acropolis was built by the local Italic tribes - possibly the Hernici themselves or their neighbors - between the 7th and 5th centuries BC, when the region was not yet a part of the Roman Republic.

Early tradition, however, declares the origins of Alatri belonging to still further periods. Roman historians, impressed by monuments such as Alatri, Norba and Segni, frequently attributed their construction to the mythical Pelasgians, who, in primeval times, had settled in Latium. Folklore of Rome thus had it that giant Cyclopes or perhaps Pelasgic settlers had built the walls of Alatri in a heroic era.

The other custom was that Alatri was one of the five Saturnian Cities of Latium established by the god-king Saturn in a golden age of prosperity. This myth says that the tomb of Saturn itself is in the adjacent town of Atina, that the Cyclopean walls are monuments to his rule. These stories, though not to be regarded as literal history, emphasize the air of mystery which envelops Alatri - the impression that its stones are impregnated

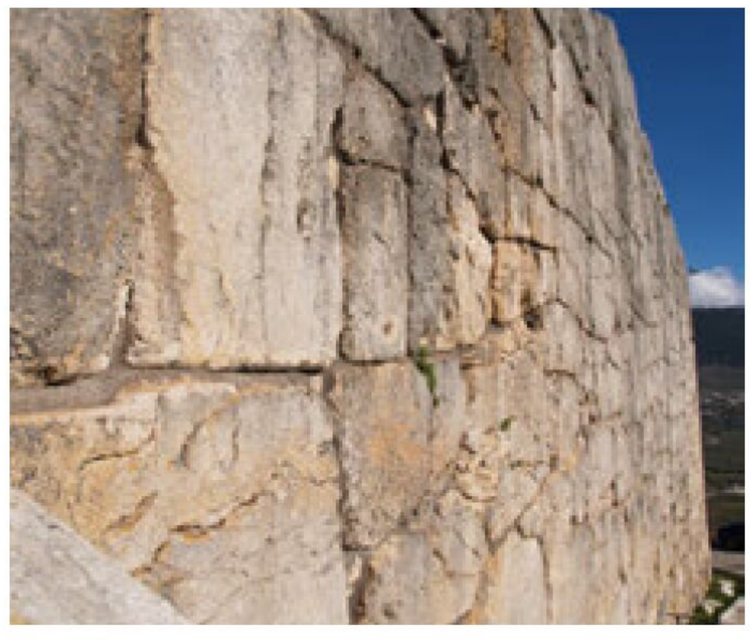
The ruins of the City of Norba, in Italy where the archaeologist found huge megalithic walls. (© e55evu)

with myth and the recollection of a bygone age.

Whether the acropolis was constructed by utilitarian Iron Age tribes or remembered as a refuge of the gods, its heritage lives on strongly today. The Cyclopean citadel of Alatri is practically intact - a rare glimpse at the potential and ideals of the Italic civilization. The walls remain to this day, 15 meters tall, and evoke half admiration and half mystery in people who pass through the gates of the acropolis. Contemporary travelers follow old ways trod by priests and settlers, or possibly timed to heavenly events and ceremonies. It is now a preserved historic site and has been proposed to be listed as international heritage (UNESCO has recognized the outstanding universal value of Alatri and is looking to have it listed as a World Heritage).

In the meantime, interdisciplinary research is ongoing: archaeologists, astronomers, and even acoustics scholars dig the acropolis hoping to learn more, both about the vibration of its stones and about

the geometry of its sight-lines. The acropolis of Alatri is where a stone and sky touch; to a veteran field archaeologist it is a monument of human art and a screen on which the ancient cosmology was projected. When you stand at the citadel during the dusk, you can feel why the creators of the citadel decided to anchor their world to this hill. Standing atop the citadel at dusk, one can sense why its architects chose this hill to anchor their world. The colossal stones underfoot align with Sun and star, linking Earth to heaven in a grand prehistoric design. In the Acropolis of Alatri, the ancients left us a profound message in mute rock: that their city was built not just for the living, but under the eternal watch of the heavens. ■



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THE COSMIC LEGACY OF NEMRUT DAĞ

THE MOUNTAIN OF GODS

BY MASSIMO BONASORTE

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On a distant mountain-top in south-eastern Turkey, one of the lost kings erected a shrine to his own immortality. The light of dawn breaks over Mount Nemrut and bathes the giant stone heads that rain down the terraces. You find yourself in the midst of fallen deities - limestone images of gods and a so-called god-king - and you are looking at the same horizon where ancient priests had looked to see omens in the heavens.
In this case, King Antiochos I of Commagene erected his tomb and temple, over 2,000 years ago, to the Sun, the stars, the calendar of heaven itself, and tied his own legacy to it.

In 62 BC, Antiochos I Theos, ruler of the small kingdom of Commagene, chose the summit of Nemrut Dağ for an audacious monument to himself and his

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gods. The mountain stands 2,134 m high, a dominant pinnacle overlooking the upper Euphrates. At its peak, Antiochos constructed a hierothesion – part mausoleum, part sacred precinct – on a monumental scale. A 50 m high cone of crushed rock marks the spot where his tomb is hidden, deliberately buried under tons of stone chips to thwart looters. Around this artificial mound, the king built broad terraces on the east, west, and north sides.
The east and west terraces became open-air stages for ritual, oriented to sunrise and sunset. On each of these terraces sat five giant limestone statues facing outward: Antiochos himself alongside deities of Greek and Persian lineage. They were flanked by guardian eagles and lions at each end. Each statue was originally about 8–9 m tall – larger-than-life figures enthroned against the sky.
The bodies still sit today, but the

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heads were knocked off a long time ago (probably by an earthquake, or by iconoclasm) and now rest on the ground, with open eyes which look in no particular direction. The figures are recognizable by inscriptions and iconography, although they are damaged. The eastern-typical royal tiara is on Antiochos; the others depict syncretic deities of the twofold heritage of Commagene. Zeus-Oromasdas is a mixture of Greek Zeus and the Persian Ahuramazda, Apollo-Mithras-Helios-Hermes is a mixture of a Persian sun god, a Greek Herakles, and the god of war. There is also a goddess, likely Commagene's patron, linked to the Greek Tyche (Fortune).

Remarkably, one of the "gods" is the king himself. Antiochos placed a statue of his own person among the pantheon, effectively deifying himself. He recorded on the sculptures' backs that he "throned likewise among the deities" the features of his own form, carved from the same quarry stone. This was not mere vanity. It was a statement of dynastic ideology and divine right to rule. Antiochos claimed descent from both Alexander the Great and the Persian King Darius. On the site's flanking stelae he carved a family tree of Greek and Persian ancestors going back 15 generations. By literally sitting himself alongside gods and legendary forebears, Antiochos signaled that he was not just a king but a divine link between the cultures of East and West.

Every element of Nemrut Dağ's design served this king's vision of sacred kingship. In a long Greek inscription – the Nomos, or sacred law – Antiochos explains that he built this sanctuary "to honor the gods [and] himself" in one breath. He describes how he founded his tomb "in closest proximity to the heavenly throne" of Zeus, believing his soul would ascend to join the gods after death. He presented himself as Theos (a god) and benefactor, who through piety had enjoyed a long, blessed reign. Far from an egomaniacal whim, the cult was meant to stabilize his kingdom. Antiochos created an official state religion centering on his own deified image, but "for the common happiness" of his people. He endowed the shrine with priests and revenue from lands to ensure perpetual rituals. In his Nomos inscription, the king decreed that

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all his subjects should gather annually to celebrate two dates: the 16th of Audnaios (his birthday) and the 10th of Loos (his coronation day). These were to be holy days “for the manifestation of the great deities” and for honoring Antiochos himself. On those days, priests in Persian robes would crown the statues of the king and gods with golden wreaths and offer sacrifices on the altars. Common people were invited to come feast, pray, and even drink wine in the king’s memory – Antiochos insisted that “grudging attitudes” be set aside during the festivals so that everyone could enjoy the celebration. In this way the king used religion and spectacle to bind his multiethnic kingdom together, placing himself at the cosmic center of loyalty and piety.

A Sky Chart Carved in Stone

Although the political reasons behind Nemrut are obvious, there is one enigmatic aspect that can lead to the conclusion that Antiochos also planned his monument and oriented it to the heavens. Archaeologists found a huge bas-relief slab (Lion Horoscopy) on the western terrace. It is a sculpture of a lion walking in a starry sky. On

the body of the lion is a pattern of 19 star figures each bearing eight rays, in place of the constellation Leo. The chest of the lion has a crescent moon. There are other, larger, star symbols above the back of the lion (each containing sixteen rays) marked with the inscriptions - these symbolize the planets Jupiter, Mercury and Mars. Essentially the slab is an ancient star map or horoscope - it demonstrates the positions of these planets in relation to the constellation Leo at a given point in time. As soon as the lion relief was discovered, scholars realized that it was an astronomical chart - perhaps the first horoscope ever shown in art.

But what moment does it register, and why? Questions of this nature have been debated for more than a century. The early researchers thought that the horoscope needed to be connected to the life of Antiochos. German scholars commissioned an astronomer in the 1880s, to find the time when Jupiter, Mercury and Mars would have coexisted in Leo in the time of the king. In the initial calculation, 17 July 98 BC was proposed, which they imaginatively supposed to be the night of the conception of Antiochos - an idea soon rejected as bad astronomy. A stricter calculation by Otto Neugebauer, a historian of ancient astronomy, gave an even closer fit on 7 July 62 BC. On that day, one would have seen the three planets in Leo at nightfall, just above the luminous star Regulus (the heart of the lion). This date coincides incredibly with the accession of Antiochos: the middle of summer of 62 BC, at which moment he probably proclaimed himself a king and started to build

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the sanctuary of Nemrut. Indeed, Theresa Goell - the archaeologist who excavated Nemrut in the mid-20th century - thought the horoscope celebrated the establishment of the monument, on that summer day itself. This reasoning is rather convincing: in ancient times the coronation of a ruler was frequently projected in cosmic terms. The relief would bear witness to the fact that the heavens decreed the reign of Antiochos by immortalizing the relative position of the planets on the day of his accession to the throne. It was also worth noting that a single scholar viewed the lion stele as portraying the katasterismos of the king - i.e. his own starification, meaning that the soul or destiny of Antiochos were literally inscribed in the stars. This cosmic conundrum is still being investigated today. The astronomers have perfected the figures and even cast doubt on the time frame. In a recent study, the search was extended well beyond 100-50 BC, and another remarkable coincidence was discovered: on 14 July 109 BC Mars, Mercury, Jupiter and the Moon all converged around Regulus in Leo. This was many decades prior to the reign of Antiochos, though the inscription of the king states interestingly that he was crowned on the day of 10 Loos (mid-July). The 109 BC coincidence is not necessarily accidental, since 10 Loos was exactly 14 July in some year. The authors of the study state that the horoscope may have been the evidence of an auspicious event in the heavens, which were subsequently utilized to date the investiture of Antiochos, or to justify his dynasty.

During the summer of 109 BC, Jupiter, Mars and Mercury in successive weeks came near the star Regulus - as though the chief gods (identified with those planets) were each in turn bidding farewell to the king star. We had the Moon (representing Commagene itself) following last, sliding under Regulus on July 14. Such heavenly order might be interpreted as a great omen: Zeus/Jupiter, Ares/Mars and Apollo/Mercury collide around the royal star and then Moon, the symbol of the kingdom, was to grant the right to a new king. Even the carvings adjacent to the relief appear to repeat this story - in the adjacent west terrace there are four “handshake” stelae (dexiosis scenes) of Antiochos shaking hands with various gods. As it were, the stars and the artwork are describing the same thing, namely the gods welcoming the king one after another. No academic agreement has been reached about which date or event the Lion Horoscope actually encodes. The most popular of these is the one offered by Neugebauer - July 62 BC - which conveniently coincides with the opening of Antiochos

and the probable beginning of construction. The Turkish Ministry of Culture even reconstructed the lion stele and displayed it in a local museum, stating that it maps the sky of 7 July 62 BC as the pointer to when construction started. The alternative 109 BC alignment is provocative to other scholars, but in itself suggests a more elaborate use of astrology as propaganda. The only thing that is certain is that this slab was not a decoration or just another ornamental addition. The Nemrut horoscope is a material connection of astronomy with royal ideology of the Hellenist period. It demonstrates that Antiochos planned his monument in line with the universe and picked an opportune time in the heavens to establish his legacy. Simply put, he dated his heavenly kings by the stars.

Aligned With the Heavens

Beyond the lion relief, researchers have looked at Nemrut Dağ's broader astronomical alignment. The entire site appears to be deliberately oriented to celestial events and cycles. The east and west terraces were not randomly placed; they frame the rising and setting of the Sun. At Nemrut's latitude, the Sun does not rise due east on Antiochos's festival day in July – it comes up at a slight angle. Indeed, surveys found that the eastern terrace and statue row are offset several degrees from true east. Initially, some thought the terrace axis pointed to the summer solstice sunrise, but it misses the solstice by about 6°. That offset is telling: it matches the position where the bright star Regulus would

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appear on the horizon around the 1st century BC. Regulus – meaning “Little King” – was a star long associated with royalty, and believed in Persian tradition to guard the heavens. By aligning his sanctuary with Regulus’s rising point, Antiochos may have literally built his “throne” facing the royal star. On his commemorative day each year, in early July, Regulus would rise in the pre-dawn sky shortly before the Sun, in the direction of watching. It is easy to imagine the dawn ceremony: as you stand on the East Terrace at daybreak, the colossal figures of the king and gods glow with the first light. In Antiochos’s time, priests might have pointed out Regulus twinkling low on the horizon – a celestial herald of the sun – and proclaimed it the king’s star. Moments later, the sun would crest the mountains and flood the terrace with light, symbolically illuminating the divine monarch and his divine companions.

It was the West Terrace, on the other hand, where the Sun sets, and where Antiochos may have celebrated his winter. It has been conjectured that the western orientation corresponds to the setting sun on the winter solstice (which, in later Roman tradition, was the birthday of Mithras). It is an attractive thought - one of the gods venerated here was Apollo-Mithras, and a solstitial coincidence might herald the renewal of the year. But the surveys indicate that the relationship is not precise and scholars are still split on whether a winter solstice was deliberately aimed at. It is obvious that ritual theater was performed on both

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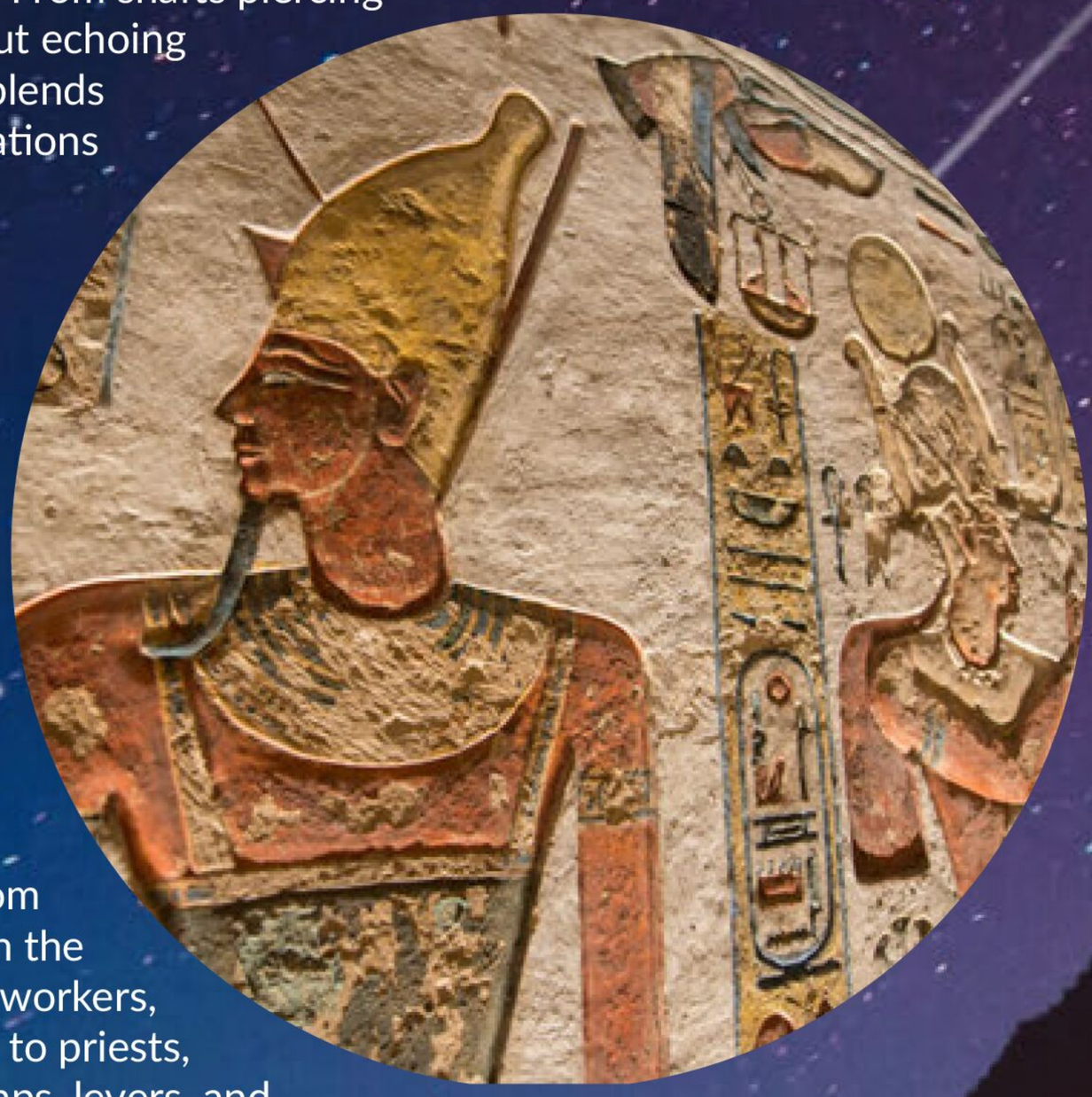
terraces in accordance with the sun cycle: one at the beginning of the day, another at the end of the day. The archaeological record endorses this flow. Each terrace was approached by a processional approach in the lower part, and there were great square altars cut into the floors of the terraces where religious services were offered. One huge fire altar remains on the East Terrace, where the services at dawn probably opened with fire and libations as the Sun came up. During the night, worshipers could be seen on the West Terrace saying goodbye to the Sun (and maybe the soul of the king) as it lowered into the night. His mountaintop shrine continued to keep its silent watch with the stars even after Rome annexed the kingdom of Antiochos in the 1st century AD. During the thousands of years, Nemrut Dag was forgotten and lost in ruins, and under the stones covering the world, its cosmic meaning was hidden. It was not discovered until towards the end of the 19th century that explorers had re-discovered this summit where the gods rest - and the strange lion carving which suggested an ancient sky-observatory use. Today Nemrut has become a UNESCO World Heritage Site due to its unusual combination of art, religion and astronomy. The site is still being examined using modern technology by scholars to determine whether the alignments there were deliberate or accidental. It is generally agreed that Antiochos I effectively wove his dynastic ideology with divine events He wove his own being into the Universe. The enormous stone statues on the top of Nemrut continue to stare out into horizons, just like they did two thousand years ago, every sunrise and sunset. Be among them at such hours, and you have all that play of light and landscape which Commagene priests and pilgrims had long ago known. The effect is what Antiochos wants you to have: you are at the door of heaven and earth. Here on this elevated spot the ambition of some Hellenistic king quite literally reaches the heavens - a royal message in stone and starlight, awaiting your eyes. ■

A COSMIC MONUMENT TO THE STARS

THE GREAT PY

The Giza Plateau. What a marvellous place to be! A place dwarfed by a mountain of stone that has defied time for over 4,500 years. The Great Pyramid, built for Pharaoh Khufu around 2580 BC, is a cosmic masterpiece. But it also shows ancient Egypt's obsession with the stars. Its precise alignments with constellations, solstices, and cardinal directions reveal a people who saw the heavens as a divine blueprint. From shafts piercing toward distant stars to a layout echoing Orion's Belt, this monument blends astonishing facts with speculations that spark the imagination.



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In Egypt's Fourth Dynasty, when the Nile Valley thrived as a cradle of ambition, the Great Pyramid rose as the ultimate symbol of power. Towering originally at 146.6 meters, it held the title of the world's tallest structure for nearly four millennia. Its construction demanded over 2.3 million limestone and granite blocks, some as heavy as 15 tons, quarried from distant sites and floated down the Nile on barges. Thousands of workers, from labourers and architects to priests, worked in harmony, using ramps, levers, and sheer determination to stack stones with precision that rivals modern engineering.

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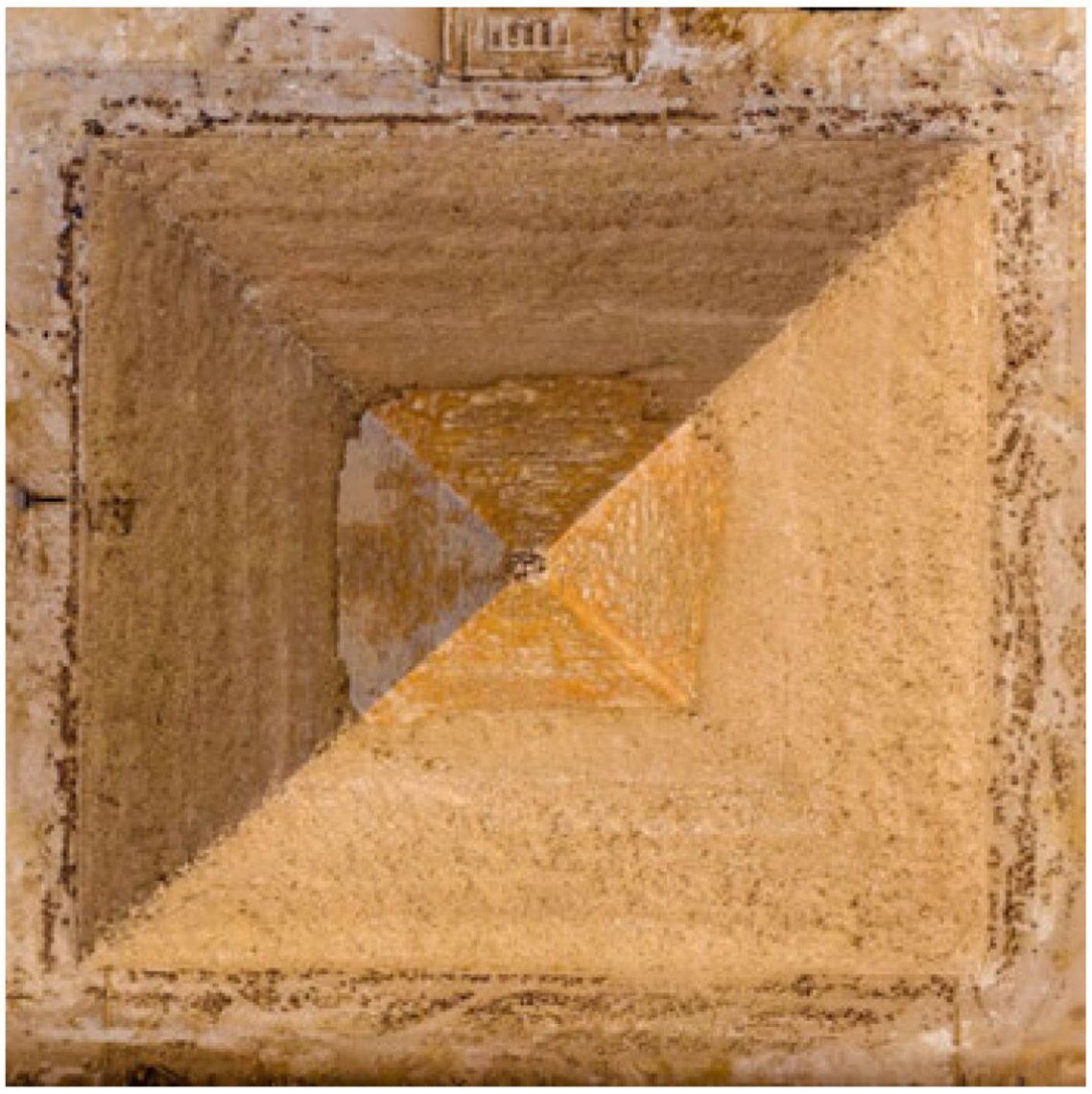
RAMID OF GIZA

BY DR IOANNIS SYRIGOS

The pyramid's base, a near-perfect square spanning 230 meters per side, aligns with true north, south, east, and west with an error of just a few arcminutes. Guesswork? Absolutely not! Builders likely tracked circumpolar stars, those that never set, to anchor the structure to the cosmos. Nestled among the pyramids of Khafre and Menkaure and guarded by the Great Sphinx, the Great Pyramid formed part of a sacred complex, a stage for rituals tying the pharaoh's soul to the gods. A monument but also a physical embodiment of ma'at, the cosmic order that kept the world in balance.



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Gateways to the Heavens

Step inside, and the pyramid's astronomical genius unfolds. Narrow shafts, barely 20 cm wide, stretch from the King's and Queen's Chambers, angling outward like arrows to the sky. Around 2450 BC, the southern shaft from the King's Chamber pointed to Orion's Belt, three stars linked to Osiris, god of rebirth and the underworld. Another targeted Sirius, the brightest star, symbolizing Isis and heralding the Nile's annual flood, a lifeline for Egypt's crops. Northern shafts locked onto Thuban, the pole star of that era, and other circumpolar stars, grounding the pyramid in eternal stability.

These shafts may have been practical tools, allowing priests to peer through and track stellar movements for rituals or calendars. Imagine priests huddled in the dim chambers, marking the moment Sirius flickered into view, signalling the flood season. The shafts transformed the pyramid into a bridge between earth and eternity, guiding Khufu's soul to the imperishable stars where gods dwelled. This fusion of spirituality and science reveals a culture that saw no divide between the divine and the observable universe.

A Dance of Light and Stone

The pyramid's design also captures the sun's eternal cycle. At the summer solstice, the sun sets along the causeway leading to Khufu's pyramid, its rays aligning 14 degrees north of west, marking the Nile's imminent flood. This moment, critical for agriculture, tied the pharaoh to Ra, the sun god, whose daily journey symbolized renewal. On equinoxes, the sun sets precisely between the Sphinx and the pyramids, casting a symbolic bridge of light, a nod to balance and rebirth. Winter solstices brought subtler effects, with shadows tracing patterns across the plateau, reinforcing the pyramid's role as a solar clock. The entire Giza complex functioned as a living calendar, syncing Egypt's life to the cosmos. Temples and causeways were oriented to catch the sun's rays at key moments, turning stone into a stage for divine dramas. Every sunrise and sunset reinforced the pharaoh's role as a cosmic mediator, ensuring the land's fertility and the people's prosperity. The pyramid's solar alignments weren't just practical; they were a declaration that Egypt's rulers commanded the rhythms of the heavens.

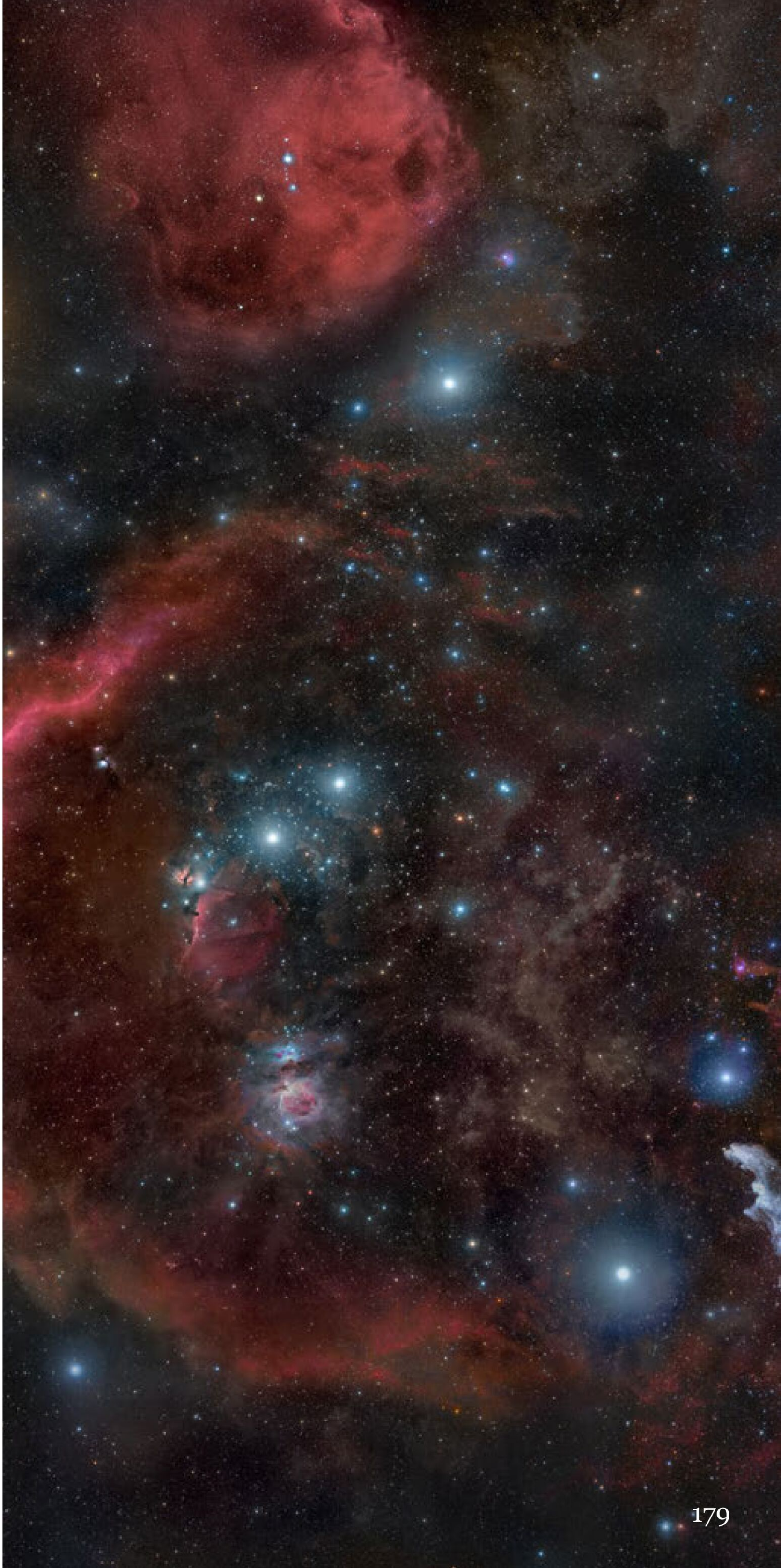
A Constellation on Earth

One of the pyramid's most captivating features is its connection to Orion's Belt, a trio of stars that held profound meaning. The three Giza pyramids, Khufu, Khafre, and Menkaure, mirror the positions and relative brightness of Alnitak, Alnilam, and Mintaka, with the Nile standing in for the Milky Way. This alignment, known as the Orion Correlation Theory, suggests the plateau was a terrestrial map of the heavens, specifically the Duat, the underworld where souls journeyed among stars. The precision of this layout, reflecting the stars' positions around 2450 BC, hints at a deep understanding of the sky.

The Egyptians revered Orion as a symbol of Osiris, whose resurrection promised eternal life. The pyramids' arrangement may have served as a ritual stage, where priests enacted myths under the stars they mirrored. Some even suggest the builders accounted for precession, Earth's 26,000-year axial wobble, aligning the site to an earlier era, perhaps 10,500 BC. While controversial, this idea points to a sophistication that challenges our view of ancient minds, suggesting they saw the cosmos as a timeless canvas for their beliefs.

Encoding Universal Truths

The pyramid's dimensions reveal another layer of genius. Its base perimeter, when divided by its height, yields a value close to 2π, hinting at knowledge of mathematical constants. The slope angle of 51.5 degrees approximates the golden ratio in certain proportions, a ratio revered

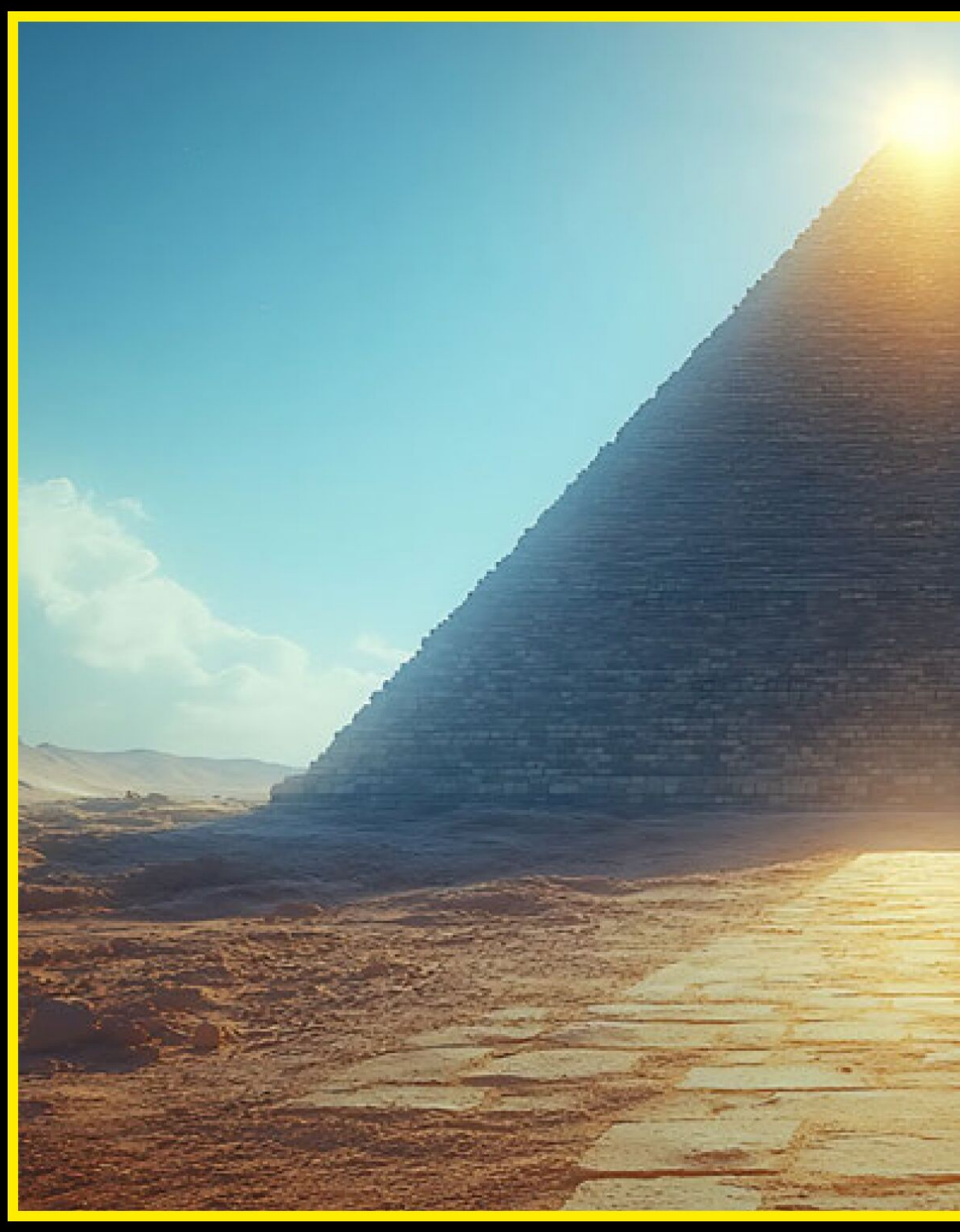


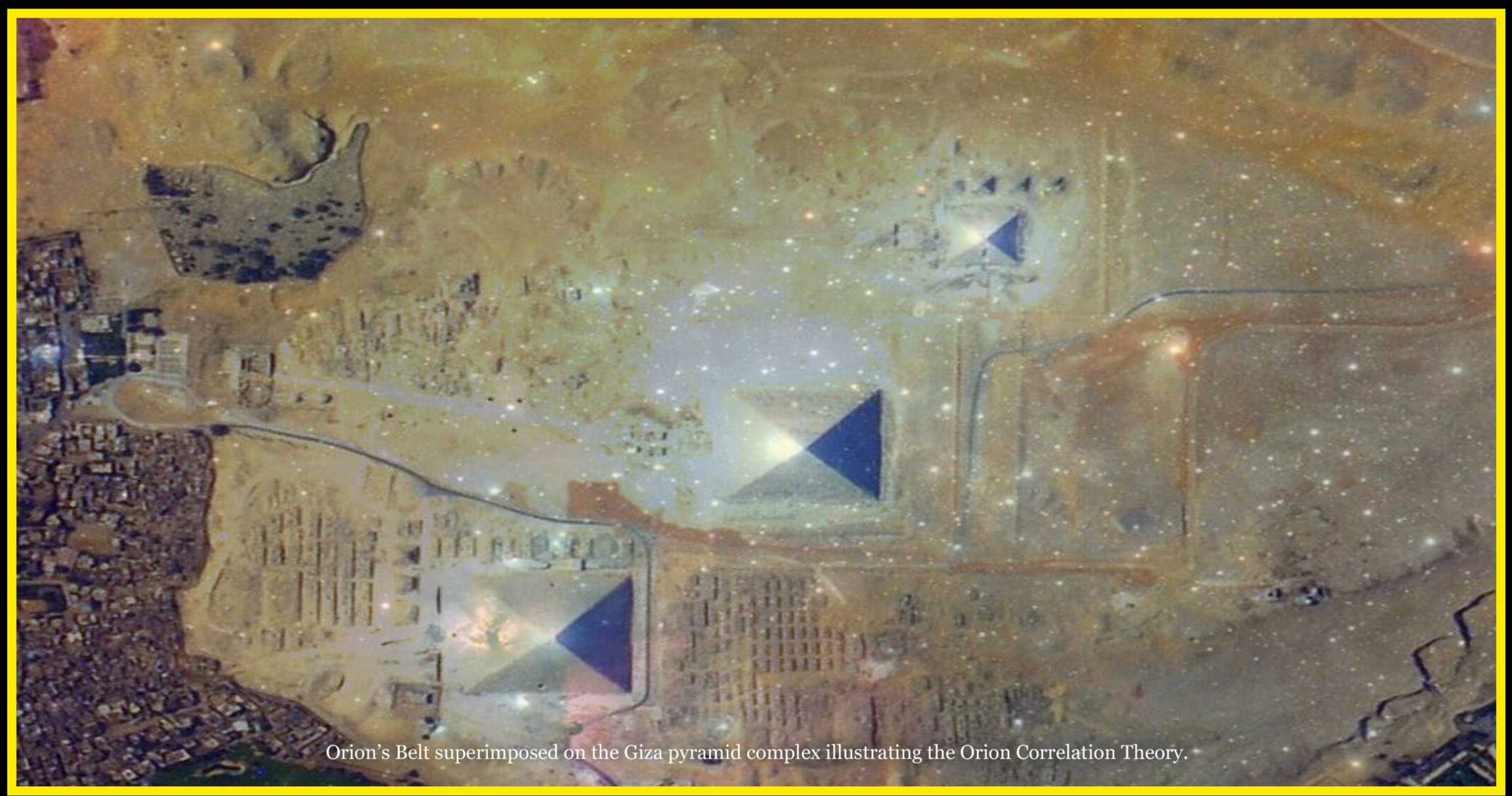
across cultures for its aesthetic harmony. These features suggest the Egyptians embedded cosmic principles in their design, seeing numbers as a reflection of divine order.

Some propose the pyramid doubled as an observatory, its flat summit offering a platform for tracking stars or predicting eclipses. Others see it as a vault of sacred geometry, preserving universal truths for posterity. The precision of its construction, blocks cut to tolerances of millimetres, implies tools and techniques far beyond simple copper chisels. Practical innovations or symbolic gestures? The pyramid's mathematical elegance shows a civilization that viewed the universe as an ordered, knowable system, accessible through stone and starlight.

The Great Pyramid spurs audacious hypotheses. Might constructors have acquired wisdom from antecedent, progressed societies? The 10,500 BC orientation evokes pre-dynastic linkages, potentially to African locales like Nabta Playa, where wanderers charted stars eons prior. Block relocation methods, executed effortlessly, hint at vanished techniques, from sonic elevation to obscured mechanics!

Extraterrestrial notions intrigue, yet proofs favour mortal cleverness, refined through aeons of sky





Orion's Belt superimposed on the Giza pyramid complex illustrating the Orion Correlation Theory.

scrutiny. Further, it could harbour profound intent: a communiqué for posterity. Alignments and scales might cipher astral or doctrinal revelations. Speculations posit it as temporal vessel, engineered to outlast disasters and steer human revival.

Debated, these concepts evoke the builders' cosmic chronometry, aspirations transcending mortality to graze perpetuity. Recent probes amplify these enigmas. In March 2025, Robert Edward Grant unveiled a breakthrough: Orion and Cygnus constellations inscribed on the Great Pyramid's north wall, aligning to configurations from 12,800 years ago. This etching suggests deliberate encoding of ancient stellar maps, possibly linking to Ice Age astronomy or lost civilizations. Grant's analysis proposes these patterns reflect precessional knowledge far predating dynastic Egypt, fuelling debates on inherited cosmic lore.

Then we have the underground anomalies that add intrigue. Early 2025 radar surveys detected vast

subterranean networks beneath Giza, including sloped structures, deep wells, and cubic forms spanning kilometres. Some dub these the mythical Halls of Amenti, repositories of arcane wisdom. Using synthetic aperture radar and cosmic-ray tech, teams mapped anomalies without excavation, hinting at hidden chambers or tunnels aligned with surface astronomy.

A 2023 corridor discovery near the entrance, 30 feet long, may connect to these depths, potentially holding stellar artifacts. These findings speculate on underground observatories or ritual spaces mirroring overhead skies, bridging earthly and celestial realms in unprecedented ways.

Building on these revelations, a July 2025 study sparked controversy by claiming the discovery of an “anomaly” near the pyramids that could indicate an ancient portal or entrance to subterranean complexes. Archaeologists using ground-penetrating radar identified L-shaped structures and voids beneath the Western Cemetery, suggesting interconnected tunnels or chambers dating back potentially thousands of years before the pyramids. This anomaly, described as a possible gateway, aligns with historical texts mentioning hidden passages

leading to underworld realms, tying into the Egyptians' beliefs in the Duat.

In June 2025, reports emerged of a second "hidden city" beneath the Giza Plateau, connecting the pyramids through vast underground networks. Researchers doubled down on earlier claims, using advanced high-frequency radar to map multi-level artificial structures nearly 2,000 feet deep. These findings, presented at the Cosmic Summit 2025, include acoustic scans revealing unexplored voids that could house artifacts or astronomical instruments. Critics debate the interpretations, but proponents argue these cities predate the Fourth Dynasty, possibly serving as observatories or ceremonial sites aligned with solstices and star risings.

Further excitement came from new hieroglyphs discovered in the relieving chambers of the Great Pyramid in June 2025. These hidden inscriptions, accessed via endoscopic cameras, reference stellar alignments and the pharaoh's journey to the stars, providing textual evidence for the pyramid's archaeoastronomical purpose. Combined with a confirmed corridor on the north face using multi-modal imaging, these discoveries suggest

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additional internal features designed to channel light or serve as viewing ports for celestial events.

A March 2025 analysis of micro-movements on the pyramid using imaging methods revealed potential internal voids leading to unknown areas. Additionally, scans of the Pyramid of Menkaure in May 2025 uncovered new voids, hinting at a plateau-wide system of hidden spaces.

Skeletons from 3000 BC, unearthed in March 2025, show Nubian origins, suggesting early astronomical influences from southern cultures. These layered findings portray Giza as a multi-era astronomical hub, with underground features possibly extending the site's cosmic alignments into hidden depths.

The Great Pyramid's archaeoastronomy rippled across history. In Egypt, its star-

aligned shafts and solar causeways inspired later temples, like Karnak, where light pierced sanctuaries at solstices. The Sirius alignment shaped Egypt's 365-day calendar, syncing agriculture with the cosmos. Beyond Egypt, similar principles appear in Stonehenge's solstice stones, Maya pyramids tracking Venus, and Chaco Canyon's sunlit carvings. These parallels suggest a shared human impulse to anchor life to the stars.

Today, the pyramid's precision inspires modern science. Engineers study its alignments for space technology, while muon scans probe for hidden chambers. Its continuing presence challenges us to rethink ancient capabilities, showing that our ancestors were not primitive but visionary, blending faith, science, and art into a monument that still speaks.

The Great Pyramid of Giza stands as humanity's boldest dialogue with the stars. Its shafts reach for Orion and Sirius, its causeways capture the sun's dance, and its layout mirrors the heavens' eternal patterns. It reveals a civilization that saw the cosmos as both map and destiny. As we marvel at its stones, we hear an ancient whisper: Look to the sky, for there lies the story of us all. ■

InnerPeace / AdobeStock

NABTA PLAYA THE

Imagine wandering the endless dunes of the Sahara, where scorching sands hide secrets older than civilization itself. What if I told you that beneath this barren landscape lies the world's oldest astronomical site? A stone circle built by ancient nomads who gazed at the stars long before the pyramids rose?

Welcome to Nabta Playa, Egypt's enigmatic gem from 4500 BC. A portal to our ancestors' cosmic wisdom. But could it hold clues to hidden knowledge that shaped human history? In 1973, a team of archaeologists led by Fred Wendorf stumbled upon massive stones protruding from the Egyptian Nubian Desert, about 100 km west of Abu Simbel. What started as a routine expedition turned into a revelation. Nabta Playa, once a lush lake basin during a wetter Sahara around 9000 BC, was home to nomadic cattle herders who transformed it into a ceremonial hub.

These early inhabitants weren't primitive wanderers. They dug deep wells, built organized villages with huts and storage pits, and even domesticated sorghum, hinting at the dawn of agriculture. By 7500 BC, the site buzzed with activity, but it peaked around 4500 BC with megalithic structures that scream "astronomy." Why here, in such a harsh spot? Perhaps the seasonal monsoons turned it into a vital oasis, drawing people for rituals under the stars. But as the climate dried up, they vanished—leaving us to ponder: Did they take their stellar secrets to the Nile?

Long before the arid expanse we know today, the Sahara was a verdant paradise teeming with life. Around 9000 BC, during the African Humid Period, increased monsoon rains transformed Nabta Playa into a seasonal lake basin surrounded by grasslands and acacia trees. This "Green Sahara" supported diverse wildlife, including gazelles, giraffes, and elephants, providing abundant resources for human habitation.

Archaeological evidence reveals how these environmental conditions promoted early human innovation. The playa, an endorheic basin that collected rainwater, became a focal point for nomadic groups who exploited its seasonal fertility. Wells dug up to 10 meters deep ensured water access during dry spells, while the fertile soil allowed for early experiments in plant cultivation, such as sorghum. But this lush era was fleeting; by 3500 BC, shifting climate patterns driven by changes in Earth's orbital precession, led to rapid desertification. The site's abandonment coincides with this arid shift, prompting migrations

The Stone Circle in Nabta Playa.

that may have carried cultural seeds eastward to the Nile Valley.

A Mini-Stonehenge in the Sand

At the heart of Nabta Playa stands the “calendar circle”. A modest ring of stones, just 4 meters wide, far smaller than Stonehenge but 2,000 years older. Built around 4800 BC, it features upright slabs dragged from over a mile away, some nine feet tall.

Don’t let the size fool you; this was no random arrangement. Two key sightlines pierce the circle: one pointing north, the other aligning with the summer solstice sunrise. As the sun crested the horizon on that fateful day, it signalled the monsoon rains, lifeblood for these herders and their cattle. Nearby, a massive cow-shaped rock sculpture and buried cattle bones reveal a deep reverence for bovines, possibly an early form of worship. Intrigued yet? Is it possible that this circle was a sacred stage for starlit ceremonies?

Cattle held profound significance at Nabta Playa, transcending mere sustenance to embody spiritual and social pillars. Excavations uncovered numerous cattle burials, often in clay-lined chambers with young bovines sacrificed in elaborate rituals. This “cattle cult” likely symbolized fertility, wealth, and cosmic order, with cows representing the nurturing forces of the heavens.

Evidence suggests domestication of cattle occurred here as early as the Middle Neolithic, around 7000 BC, marking a shift from hunting to pastoralism. Bos remains indicate selective breeding, advancing socio-economic changes like organized labour for herding and rituals. Speculatively, these practices foreshadowed Egyptian deities like Hathor, the cow-goddess of the sky, whose cult emphasized stellar connections.

The buried bones, sometimes arranged in patterns, hint at offerings to ensure rains and prosperity, blending practical survival with mystical reverence in a harsh, changing environment.

Mapping the Heavens in Stone

Here’s where facts turn fascinating. The site’s megaliths radiate like spokes from a central hub, aligning with key celestial bodies. Around 4500 BC, lines pointed to Arcturus, Sirius, and Alpha Centauri, bright stars that guided nomads across the desert.

One alignment mimics Orion’s Belt, with stones representing the constellation’s stars as they rose around 6400 BC. Using GPS and satellite imagery, researchers confirmed these weren’t

SAHARA’S FORGOTTEN OBSERVATORY

Abu Simbel Temple. (© Calin Stan/Adobe Stock)

Wadi Sura Swimmers, The Sahara Desert was very different in the past.

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coincidences; the nomads observed the skies with precision rivalling later civilizations. Without a North Star back then, they relied on these alignments for navigation and timing rituals. But why such effort? Survival, yes, but maybe something more profound, like decoding the universe's rhythms.

How did these nomads achieve such precise alignments without modern instruments? Archaeological finds suggest sophisticated techniques, including the use of plumb lines, sighting poles, and natural landmarks for orientation. Stones, quarried from bedrock over a kilometre away, were shaped and transported using sledges and rollers, demonstrating communal effort and engineering prowess.

Pottery shards and tools indicate a toolkit of flint chisels and grinders, while hearths point to fire-hardened implements. Speculations include the use of water levels or shadow-casting methods to track solstices accurately. This ingenuity hints at a proto-scientific mindset, where empirical observations of the sky informed construction. Could they have employed basic mathematics, like counting paces or using knotted cords, to measure angles? Such methods would prefigure Egyptian surveying, underscoring Nabta's role as a technological cradle.

Now, let's venture into the speculative realm that makes Nabta Playa irresistible. Could this site be the cradle of astronomy, predating even European megaliths like Goseck or Mnajdra? Some theorists whisper that the buried "table rocks" and empty tombs symbolized portals to the afterlife, linking earth to the stars.

Could it be that these herders, facing a drying Sahara, used the circle to predict rains and migrations. But did their knowledge migrate too? As the desert encroached around 3500 BC, people may have fled to the Nile, carrying ideas that blossomed into Egypt's star-aligned pyramids and the Hathor cult, goddess of the sky, often depicted as a cow. Controversial? Absolutely. Some call it the "Black Genesis" of Egyptian civilization, blending African roots with cosmic lore. What if Nabta Playa holds a hidden code, much like ancient architects encoded geometry in their designs? The stars aligned here might reveal forgotten wisdom about our place in the cosmos.

Comparative Megaliths: Global Connections

Nabta Playa's stone circle invites comparisons with other ancient sites, highlighting a global fascination with the stars. Unlike Stonehenge's grand sarsens, Nabta's modest scale belies its antiquity, predating the Wiltshire monument by millennia. Similar alignments appear at Göbekli Tepe in Turkey, where 11,500-year-old pillars may encode astronomical events.

In Europe, sites like Goseck in Germany feature solstice-oriented enclosures from 4900 BC, echoing Nabta's calendar function. Speculatively, did independent innovations or cultural diffusions link these distant societies? Nabta's African roots challenge Eurocentric views, suggesting astronomy's cradle lay in the Sahara, influencing Mediterranean and Near Eastern traditions through trade or migration. These parallels fuel debates: Were humans worldwide responding to similar cosmic cues, or does Nabta represent a unique, pioneering hub?
The links don't stop at speculation. Nabta's cattle burials echo Egypt's Old Kingdom rituals, where cows symbolized fertility and the heavens. Sirius, aligned at Nabta, later marked the Nile's flood in pharaonic calendars.

Did these nomads seed the astronomical prowess behind the Great Pyramid's alignments? Human remains show sub-Saharan African traits, suggesting a cultural flow northward. It's a tantalizing thread: From desert stones to riverbank wonders, Nabta Playa might be the missing link in humanity's star-struck story. But beware, mainstream history often

buries such connections. Why? Perhaps to preserve a Eurocentric narrative.

Ongoing studies continue to illuminate Nabta Playa's secrets. In 2025, a computer-aided analysis reinterpreted the stone circle, confirming alignments with solstice and stellar risings using advanced simulations. This research suggests the site's builders possessed precessional knowledge, adjusting for Earth's axial wobble over centuries.

New excavations revealed additional megalithic clusters, potentially expanding the observatory's scope. DNA analysis of remains links inhabitants to Nile populations, strengthening migration theories. These findings, presented at international conferences, revive debates on Nabta's influence, portraying it as a sophisticated centre where astronomy intertwined with emerging social hierarchies.

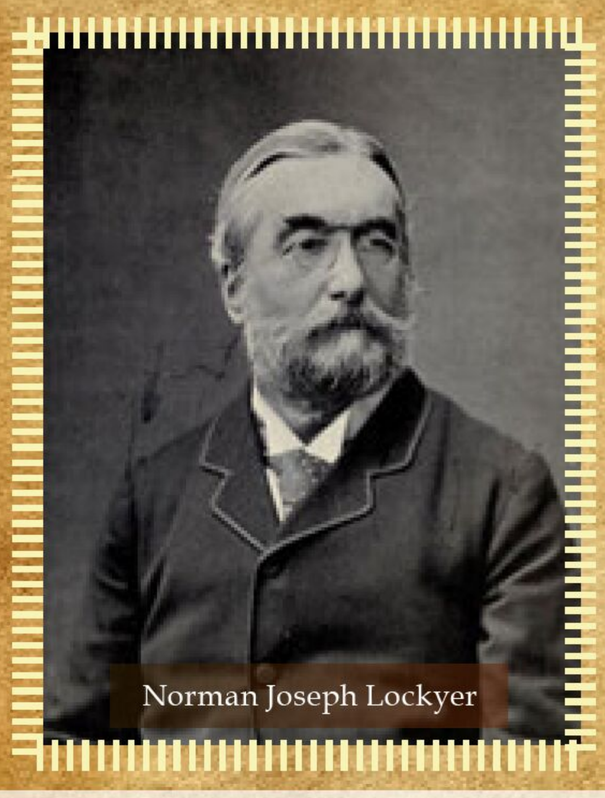
Today, Nabta Playa faces threats from climate change, looting, and tourism. Sandstorms erode stones, while unregulated visits risk damage. Conservation efforts, led by Egyptian authorities and UNESCO, aim to protect the site through fencing and digital mapping. Future research promises more revelations: Drone surveys and AI analysis could uncover buried structures, while interdisciplinary teams explore bioarchaeological links to health and diet. As technology advances, Nabta may yield codes to ancient worldviews, bridging past and present in our quest for cosmic understanding.

As we wrap up, Nabta Playa is a 4500 BC marvel that tracked solstices, stars, and seasons with stones alone. Yet, questions linger: Were these alignments for practical survival or spiritual enlightenment? Did they encode a universal knowledge lost to time? Next time you gaze at the stars, think of those nomads and wonder what else the desert hides. ■

History Heroes recognizes the remarkable work of people, past and present, who have played a significant role in advocating for archaeology, history, cultural traditions, and heritage sites.

SIR NORMAN LOCKYER
FATHER OF ARCHEOASTRONOMY

By Gary Manners



Norman Joseph Lockyer

In the pantheon of Victorian scientific pioneers, few figures shine as brightly as Sir Joseph Norman Lockyer, a man whose insatiable curiosity about the cosmos led him to discover a new element, found one of the world's most influential scientific journals, and establish an entirely new field of study that bridges astronomy with archaeology.

Born on May 17, 1836, in Rugby, Warwickshire, Lockyer would become known as the "father of archaeoastronomy" and leave an indelible mark on multiple scientific disciplines that continues to influence research today. Lockyer's path to scientific greatness was far from conventional. The son of Joseph Hooley Lockyer, a surgeon-apothecary who pioneered work with the electric telegraph, Norman initially followed a career in civil service, working as a clerk in the War Office from 1857. However, his true passion lay in astronomy, which he pursued as an amateur enthusiast from his home in Wimbledon, South London, using a 6¼-inch telescope that would become the instrument of one of the most significant astronomical discoveries of the 19th century.

The Discovery That Changed Chemistry Forever

The year 1868 marked a watershed moment in both Lockyer's career and the history of science. On August 18, during a total solar eclipse, French astronomer Pierre Janssen observed a mysterious yellow line in the solar spectrum. Just two days later, Lockyer made the same observation from his London observatory, independently detecting this enigmatic spectral signature. The discovery of helium would prove to be one of the most remarkable achievements in astronomical spectroscopy.

Working with renowned chemist Edward Frankland, Lockyer determined that this yellow line, with a wavelength of approximately 588 nanometers,

could not be attributed to any known terrestrial element. With characteristic boldness, he proposed that the line indicated the presence of a previously unknown element in the Sun's atmosphere. He named this mysterious substance "helium," after the Greek word helios, meaning sun. This marked the first time in history that an element had been discovered in space before being found on Earth - a testament to the power of the emerging science of spectroscopy.

This discovery would prove to be incredibly significant. Helium would later prove to be the second most abundant element in the universe, yet it remained undetected on Earth until Scottish chemist William Ramsay isolated it in 1895, nearly three decades after Lockyer's solar observations. Today, helium's unique properties make it indispensable for applications ranging from medical imaging to space exploration, while Lockyer's spectroscopic methods laid the foundation for modern astrophysics.

Some Fellows of the Royal Society (Wellcome).

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Pioneering Archaeoastronomy

Perhaps Lockyer's most innovative contribution was his pioneering work in what would become known as archaeoastronomy, the study of astronomical alignments in ancient monuments. In 1890, during travels through Greece, Lockyer observed the consistent east-west orientation of many temples and began to suspect that ancient architects had deliberately aligned their structures with celestial phenomena.

This observation led him to Egypt, where he discovered that numerous temples were oriented toward the rising point of Sirius, the brightest star in the night sky, and toward sunrise at the summer solstice. His systematic study of these alignments, documented in his groundbreaking 1894 work "The Dawn of Astronomy," established the scientific foundation for understanding how ancient civilizations incorporated astronomical knowledge into their architecture and religious

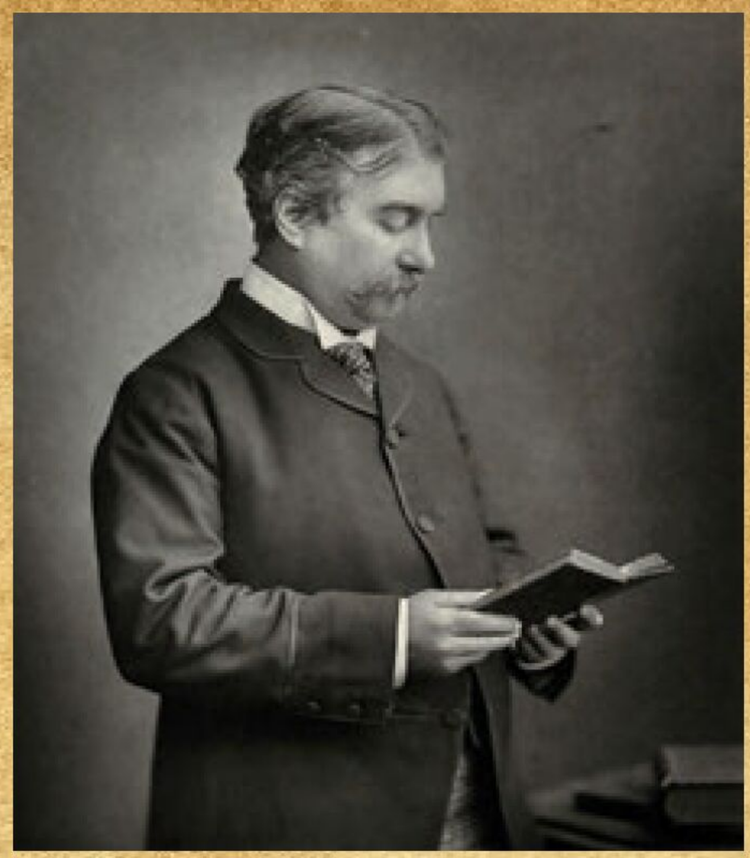
Norman Lockyer's seven-prism spectroscope and eyepiece used for solar observations Source. Science Museum Group Collection

practices. Lockyer's most famous archaeoastronomical investigation focused on Stonehenge, where he calculated that the monument's heel stone aligned with sunrise at the summer solstice. Based on this astronomical alignment, he estimated Stonehenge's construction date at 1680 BC - remarkably close to the radiocarbon dating of 1800 BC that would be established decades later. This work demonstrated how astronomical observations could provide independent dating methods for archaeological sites, opening an entirely new avenue of historical research.

Founding Nature: A Legacy in Scientific Communication

Lockyer's contributions extended far beyond astronomical discovery. Recognizing the need for better communication between scientific disciplines, he established the journal Nature in 1869, partnering with publisher Alexander MacMillan. This weekly publication was revolutionary in its scope, designed as "a public forum for scientific innovations" that would bridge the gap between specialized research and broader scientific understanding.

As Nature's founding editor,



Lockyer wielded considerable influence over Victorian scientific discourse for over five decades, remaining at the helm until shortly before his death in 1920. His editorial vision helped establish Nature as one of the world's most prestigious scientific journals, a status it maintains today. Through Nature's pages, Lockyer promoted

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interdisciplinary dialogue and ensured that groundbreaking research reached audiences beyond narrow academic circles, fundamentally changing how scientific knowledge was disseminated and discussed.

Lockyer's scientific achievements earned him widespread recognition within the Victorian scientific establishment. In 1885, he became the world's first professor of astronomical physics at the Royal College of Science in South Kensington, where a purpose-built Solar Physics Observatory was constructed for his research. He was elected as a Fellow of the Royal Society in 1869, received the prestigious Rumford Medal in 1874, and was knighted in 1897, becoming Sir Norman Lockyer in recognition of his contributions to science.

His later years were marked by continued innovation and exploration. He led eight expeditions to observe solar eclipses, traveling to locations from Sicily to India, each journey advancing understanding of solar physics and coronal phenomena. These expeditions combined Lockyer's passion for travel with his commitment to advancing astronomical knowledge through direct observation.

Sir Norman Lockyer's death in 1920 at his home in Salcombe Regis, Devon, marked the end of an extraordinary scientific career that spanned multiple disciplines and left lasting impacts on each. The Norman Lockyer Observatory, established near his final home, continues to operate today as a testament to his commitment to astronomical research and public education.

Lockyer's interdisciplinary approach - combining astronomy, chemistry, archaeology, and even mythology - exemplified the Victorian era's scientific spirit while pointing toward modern integrated research methods. His recognition that ancient monuments encoded astronomical knowledge laid the groundwork for contemporary archaeoastronomy, a field that continues to reveal new insights about how prehistoric cultures understood and utilized celestial phenomena.

From discovering helium in the solar spectrum to decoding the astronomical alignments of Stonehenge, Sir Norman Lockyer demonstrated that scientific curiosity knows no boundaries. His legacy reminds us that the greatest discoveries often emerge from the intersection of different fields of knowledge, where careful observation meets bold theoretical thinking. In an age of increasing scientific specialization, Lockyer's example of interdisciplinary excellence remains as relevant today as it was during his remarkable career over a century ago. ■

By Massimo Bonasorte

Lost Flavors: The Food of Heroes: Meat and Lentils in the Iliad (part 1)

The Late Bronze Age in Greece, the period of the Mycenaean (16th-12th century BC) was a period of the prosperity of the palaces, and herding, and agricultural based diet. Archaeological evidence, and Linear B tablets portray a diet that was both simple and varied in nature on a daily basis.

Cereals were the basic food: barley, emmer, and wheat were eaten either as unleavened bread or as porridges and soups. Carbohydrates were supplied mostly by these grains, usually in the form of a broth of barley or a thick gruel. The Mycenaeans used legumes extensively to provide protein.

Sacrifice boar,
Greek Vase, Louvre.

Cooking recipes from the ancient world

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Lentils, peas, fava beans, chickpeas and grass peas have been identified in almost every Aegean settlement of this era. Such pulses were usually dried to be stored and served in soups and they were the basis of the protein intake in the diet together with the dairy products. Fruits (figs, grapes and pomegranates in particular) also accompanied meals and they were a source of vitamins and fiber. Meat, however, was not a daily food of large amounts. Domesticated animals - sheep, goats, pigs and cattle - had more economic and practical significance than just their meat. Sheep and goats were reared primarily to provide wool and milk; oxen were draft animals. The remains of animals' bones indicate that the most frequently consumed meat was that of sheep, goats, swine and only occasionally that of cattle, usually slaughtered at a young age, and consumed probably by the family that kept them. Hunting and fishing were sources of additional protein: inland communities ate game (deer, boar, hare and birds), whereas coastal communities depended greatly on fish and seafood.

This practical image of Mycenaean food is, however, very unlike the diet as represented by the Homeric poems, written in the 8th century BC, but set in that earlier heroic period. According to one scholar, Barry B. Powell, the food eaten by Greek heroes was mainly meat, even though fish and legumes were important to the Greek diet. Such a narrative option represents symbolic

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values, not everyday life: to see the point, we need to consider the symbolism of the Homeric feast.

The Homeric Banquet and the Symbolism of Meat

In Homer's Iliad and Odyssey, communal meals carry profound ritual and social significance. The heroes subsist almost exclusively on roasted meat, accompanied by bread and wine, within the context of religious sacrifice and warrior fellowship. Archaeology confirms that in Mycenaean times, people took their meals seated in a circle around a central hearth.

A typical Homeric scene has the Achaeans, after battle, lighting fires, roasting meat, and pouring wine – all as offerings to the gods and sustenance for the warriors. As one modern analysis notes, "in the Homeric cycle, bread, red wine, and roasted beef are the only things served to the heroes". Other available food sources – fish teeming in the seas, game in the forests, vegetables and fruits from cultivation – are ignored in the Iliad. Even in the Odyssey, which presents more varied settings, references to alternative foods are scarce: for example, Odysseus's crew use hooks to fish (Od. 12.331) and the well-watered orchard of King Alcinous is described with drooping fruit-laden branches (Od. 7.115–131), but none of the epic's protagonists are ever shown actually interested in eating fish or fruit. Instead, the consumption

of roasted meat and wine is what distinguishes civilized, aristocratic humans and heroes from monsters or savages.

A telling example is the Cyclops Polyphemus in the Odyssey: this one-eyed giant flouts the expected code of hospitality by gruesomely feasting on raw human flesh instead of offering cooked food to his guests, thereby marking himself as a barbaric outsider. To the Greeks, sharing cooked food around a fire was an essential marker of culture; anyone who failed to do so was deemed bestial.

In the Homeric world, therefore, the ritual banquet is a solemn affair. Before eating, the heroes always honor the gods with a sacrifice: a portion of the meat is offered to the divine (burned on the altar), while the rest is evenly divided among the participants. Sharing meat in this way cements group bonds and signifies the gods' approval. As one modern author puts it, "barbecued meat was considered the food of gods and heroes." The warriors of the Iliad, we read, "feasted on hearty portions of goat, pork, and mutton roasted on spits," food that gave them the strength to heft boulders and vanquish giant foes. In scene after scene, great chiefs like Achilles, Agamemnon, or Odysseus are depicted roasting meat and mixing wine in golden cups, an image that celebrates both the camaraderie of warriors and the bond with the gods through the sacrificial flame. ■

(End of part 1)

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Mycenaean Lentil and Meat Stew

Ingredients (serves 4)

Salt to taste, and water as needed.
- 300 g of ancient lentils (Lens culinaris, an heirloom variety of small brown lentils)
- 100 ml pork blood (available from specialized butchers or substituted with blood sausage or pasteurized blood)
- 500 g of lamb meat (cut into chunks, preferably from the shoulder or leg)
- 100 ml red wine vinegar
- 1 wild onion (ancient variety; or a pungent red onion as substitute)
- 1 small onion, finely chopped
- 1 cup of resin-infused red wine (red wine flavored with pine resin, an ancestor of modern retsina, commonly used in antiquity)
- Fresh oregano
- 3 tablespoons of olive oil (olive oil was already produced in Mycenaean Greece)
- 2 sprigs of wild oregano

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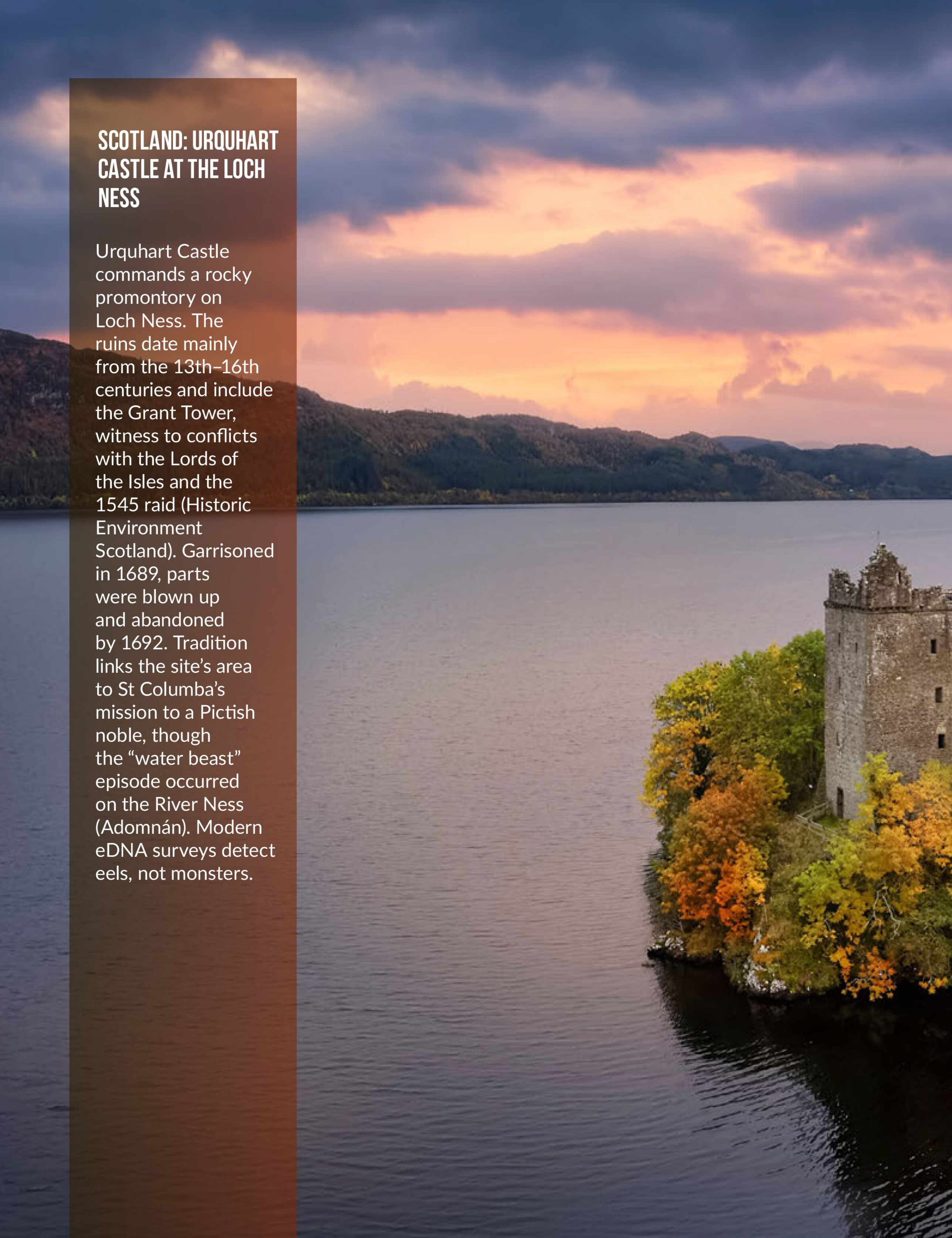
Instructions

Preparation: Heat the olive oil in a clay pot or in a deep-bottomed saucepan, and sauté the chopped wild onion and garlic (where applicable) until it turns golden. The lamb pieces can be added and then browned on high heat and stirred with a wooden spoon. Add the resinous red wine to deglaze, allow the alcohol to evaporate and the piney aroma to permeate the meat. Then add the lentils (no need to soak them, but small old-fashioned ones should be rinsed) and add just enough fresh water to cover all. Add the leaves of the wild oregano and a pinch of salt. Boil the stew and cover and allow it to simmer. The cooking time will depend (about 1 to 1.5 hours) when the lentils are tender and the lamb is soft. Stir every now and then using a wooden spoon and in case it begins to dry up, add some hot water to keep the consistency in a soupy form. At the cooking end the stew must be thick and substantial: the lentils will have dissolved a little to form a creamy bottom mixed with the lamb juices and resinous wine. Adjust salt to taste.

This is a recipe translated into the modern kitchen, but it provides a notion of what may bring together the cuisine of heroes and ordinary people: the festive roasted meat of the elite mixed with the lentil of the masses. With every bite, a taste of blood sacrifice and daily food can be had. It is a savory stimulus that in the history of food, as in the Iliad, there were always, alongside the gods and heroes, the common folk - and, now and then, even Achilles himself might have been glad to partake of a good bowl of lentil stew in his tent, without the din of arms.

To serve

One may serve this stew in rough clay bowls. There were no personal utensils (personal cutlery was not widespread in the Bronze Age), and each diner might pick up stew with barley bread or share a spoon. The meal has a hearty taste: the sweet, homey-smelling lentils and onion are combined with the juicy flavor of lamb, and the oregano and wine flavored with pine give the dish a woody aroma reminiscent of Mycenaean fireside cooking herbs and meat.



SCOTLAND: URQUHART CASTLE AT THE LOCH NESS

Urquhart Castle commands a rocky promontory on Loch Ness. The ruins date mainly from the 13th–16th centuries and include the Grant Tower, witness to conflicts with the Lords of the Isles and the 1545 raid (Historic Environment Scotland). Garrisoned in 1689, parts were blown up and abandoned by 1692. Tradition links the site's area to St Columba's mission to a Pictish noble, though the "water beast" episode occurred on the River Ness (Adomnán). Modern eDNA surveys detect eels, not monsters.

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